TECHNOLOGY DEPT.

Gas Journal

Vol 265. 103rd Year. LONDON, JANUARY 10, 1951. No. 4571. Price 1/-
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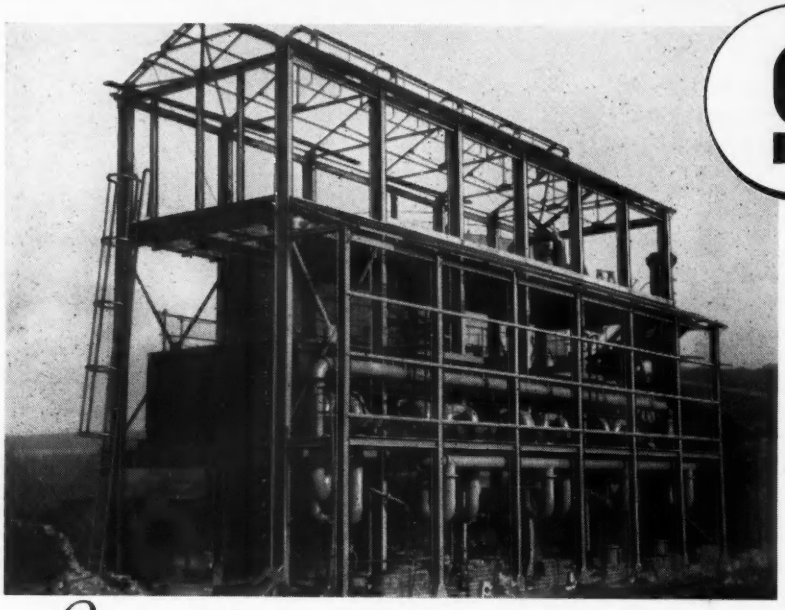
These vessels were designed and constructed in accordance with British Standard Specification.



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Years of experience in the design of gasworks plant have made Oxley pre-eminent in this field. Illustrated is a set of four Purifier Boxes in course of erection each 14 ft. square by 6 ft. deep complete with 12 in. dia. connections and valves. The whole unit is housed in a steel framed building with annexe connection house. 10 ft. above the boxes is a reinforced concrete oxide storage floor, 60 ft. long by 17 ft. wide. Chutes are built in this floor for feeding boxes. The house is sheeted with asbestos corrugated sheeting and "Perspex" lighting. A 5 cwt. barrow hoist is installed for lifting oxide to the storage floor. Side chutes are also fitted for feeding existing ground floor purifiers from the storage floor.

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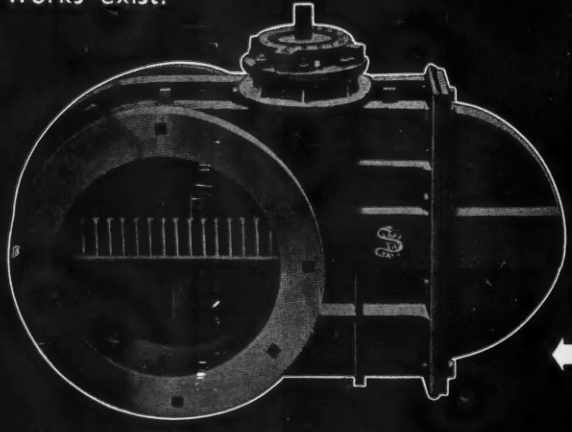

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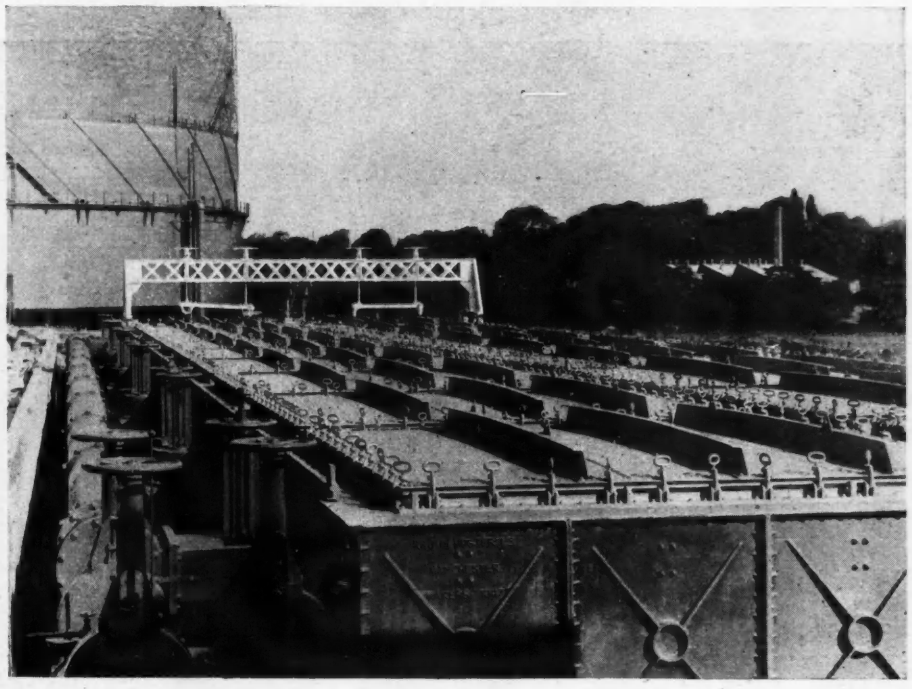

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A

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In 'Fibreglass' Staple Tissue the fibres are bonded to form a thin, pliable tissue with special advantages in pipe wrapping.

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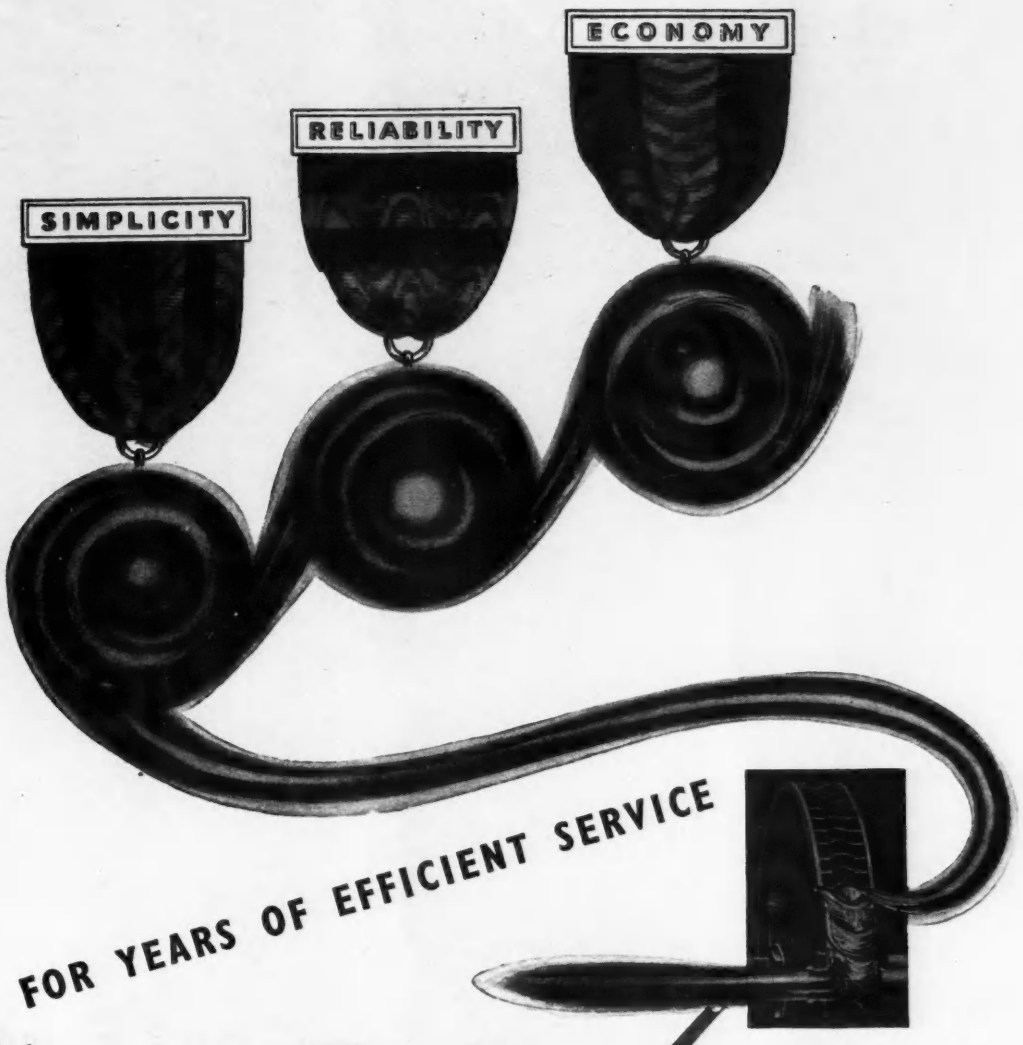

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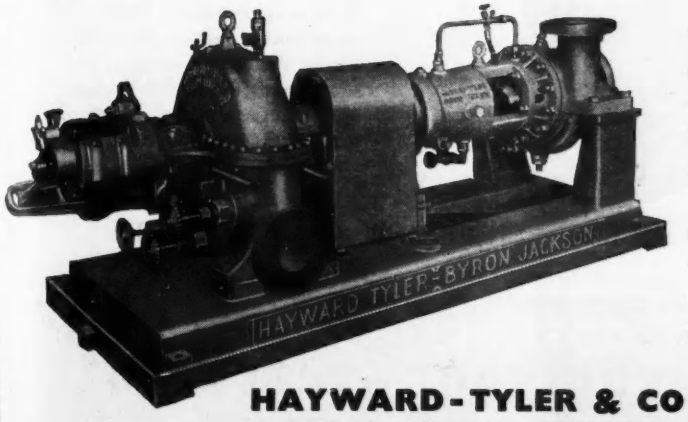
Hayward Tyler-Terry Turbine



There are prime movers deserving of one, or even two, of these medals — but we know of none with so strong a claim to all three as has the Hayward Tyler-Terry turbine. In construction and in operation it is unique — using that much abused word advisedly in its literal sense. For its efficiency as a prime mover for pumps, and in an installation providing steam for heating or process work, this turbine is emphatically recommended. The full citation is available to you, and is well worth the reading.

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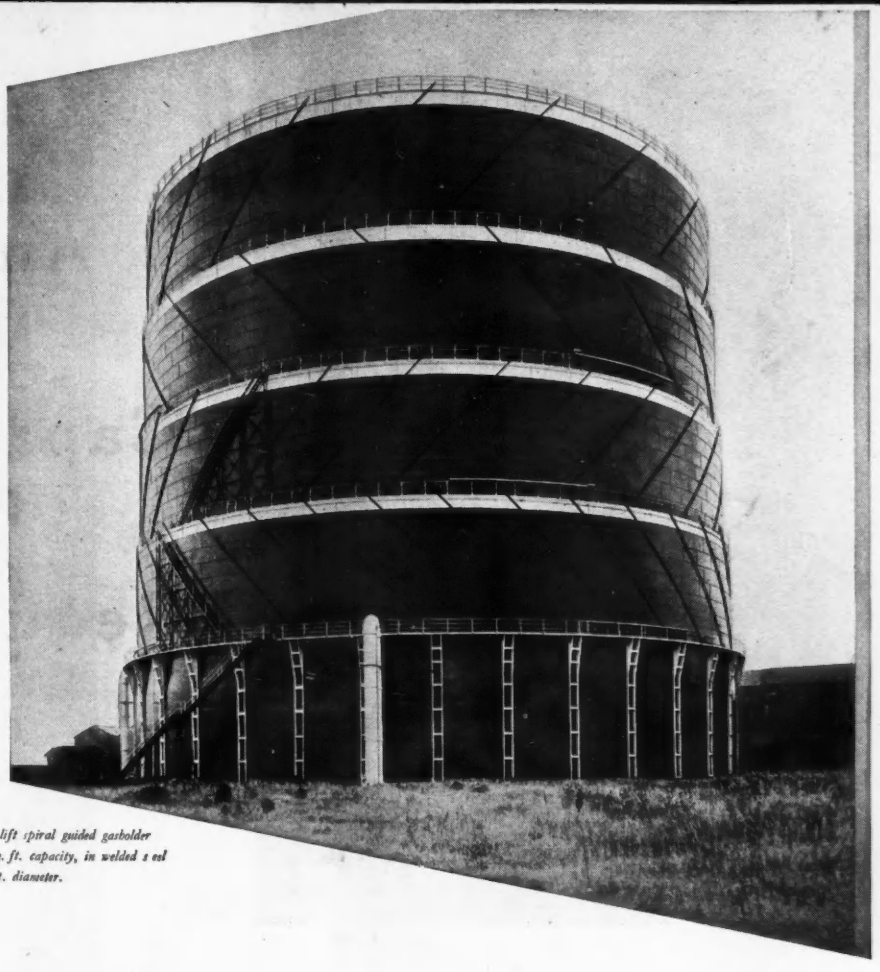

★ *View of 4 lift spiral guided gasholder 3 million cu. ft. capacity, in welded steel tank 182 ft. diameter.*

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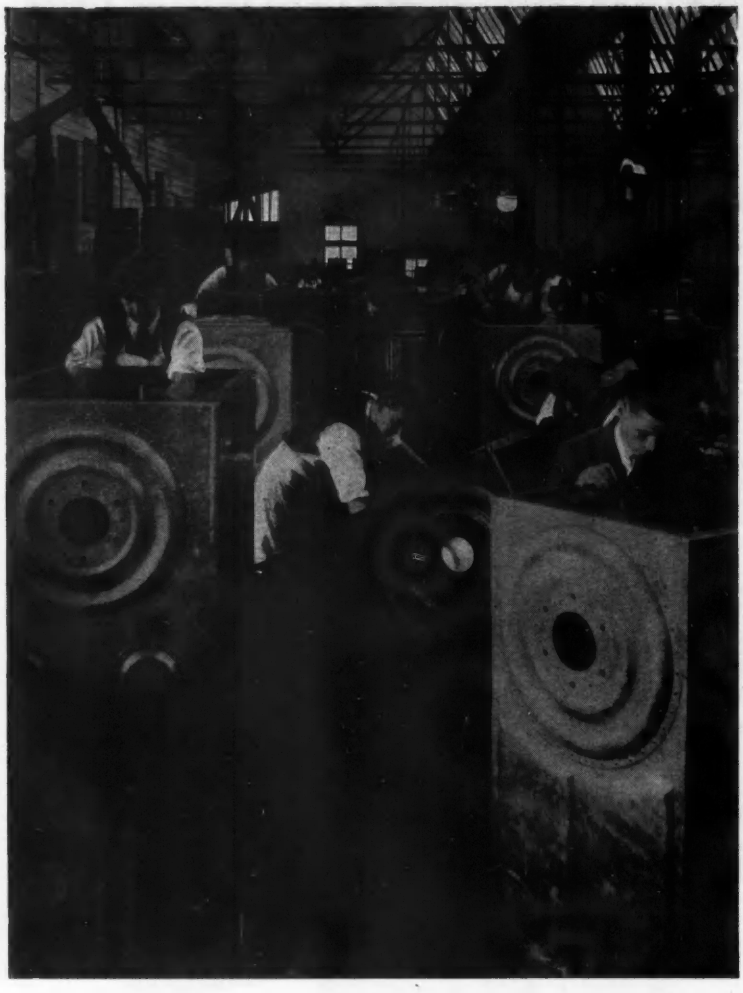

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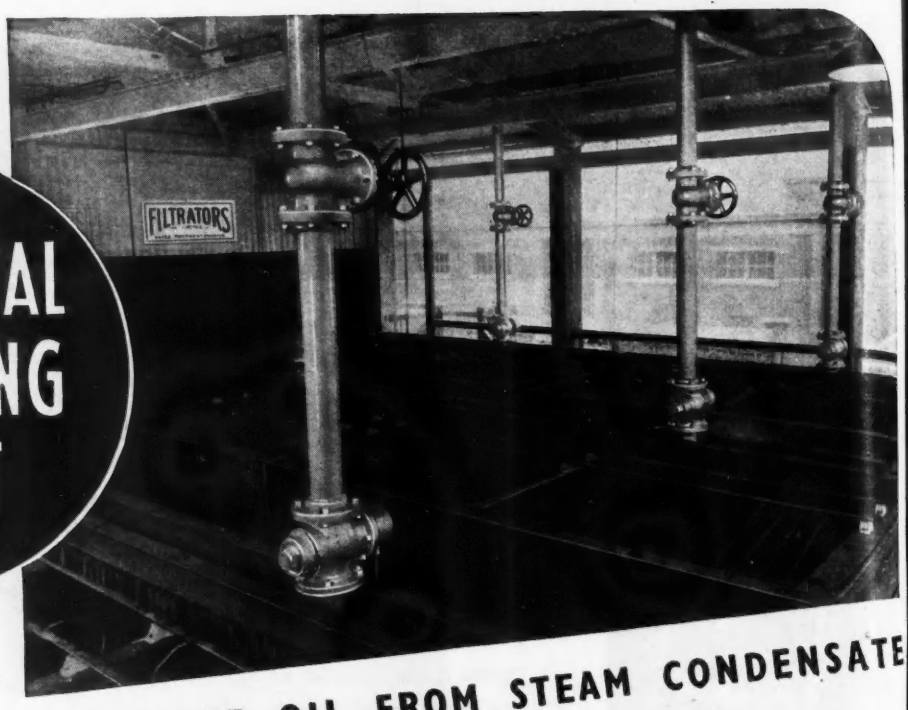

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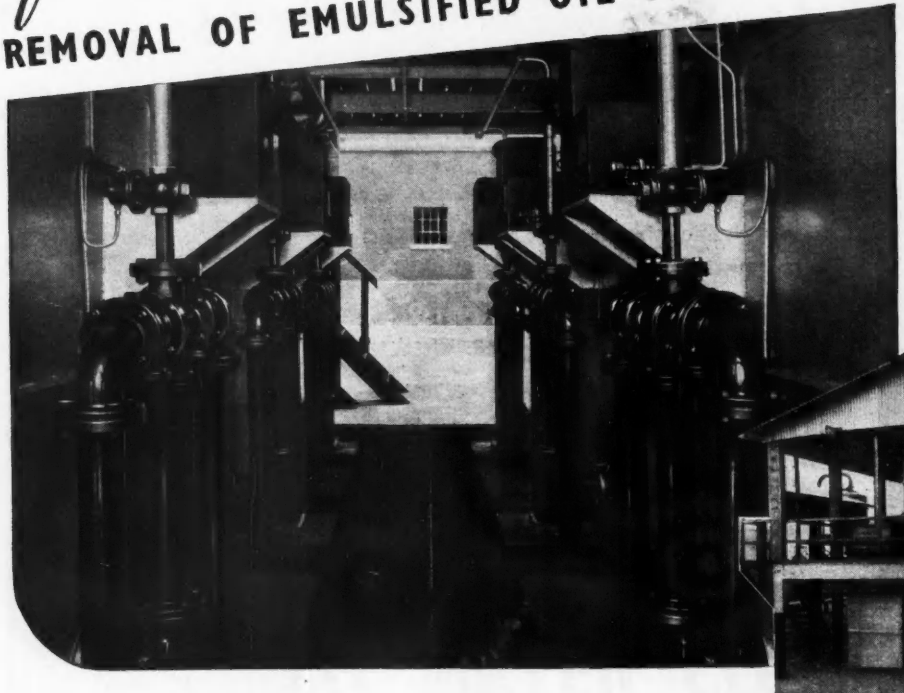

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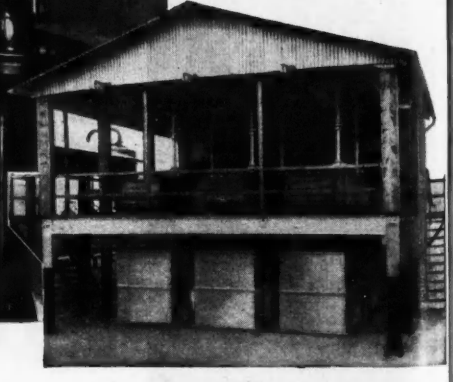

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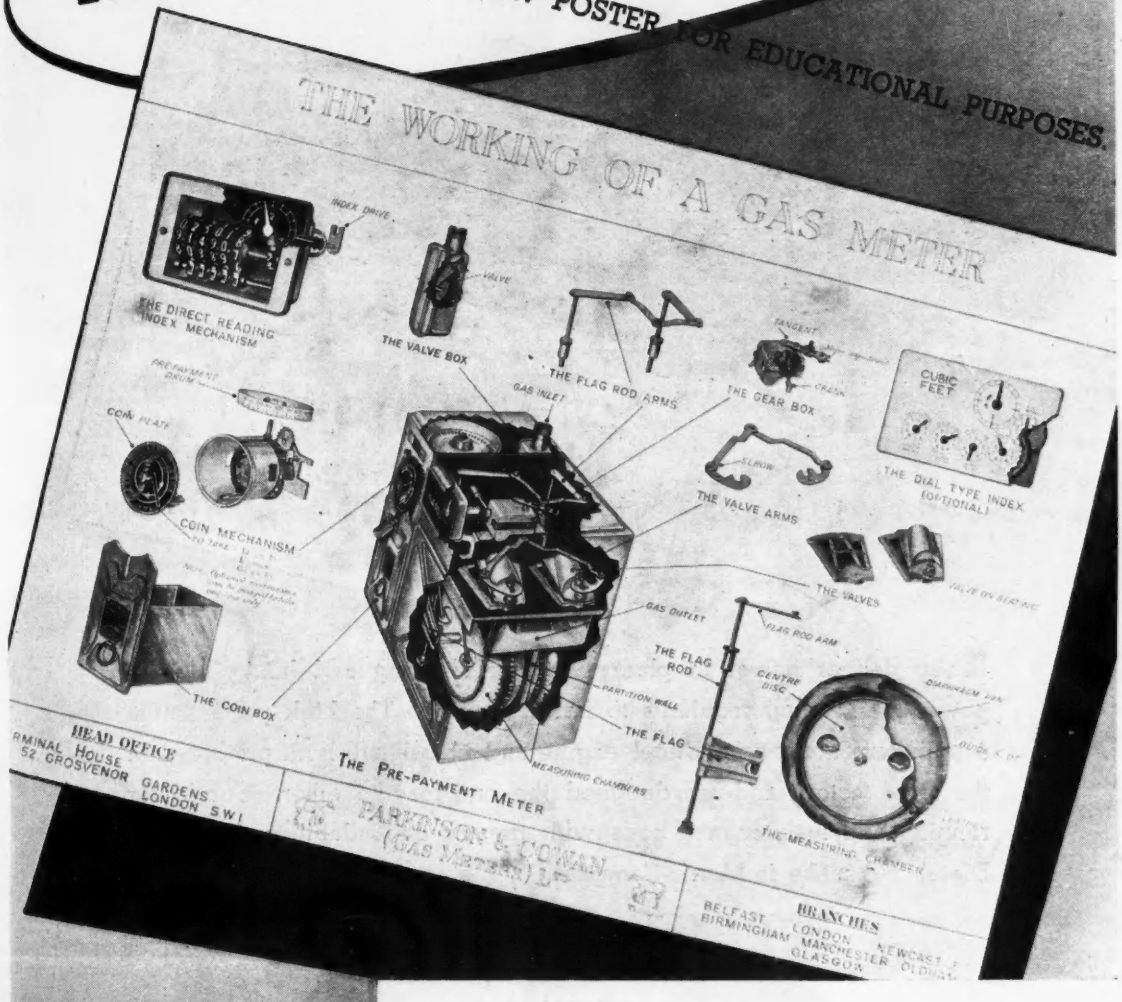

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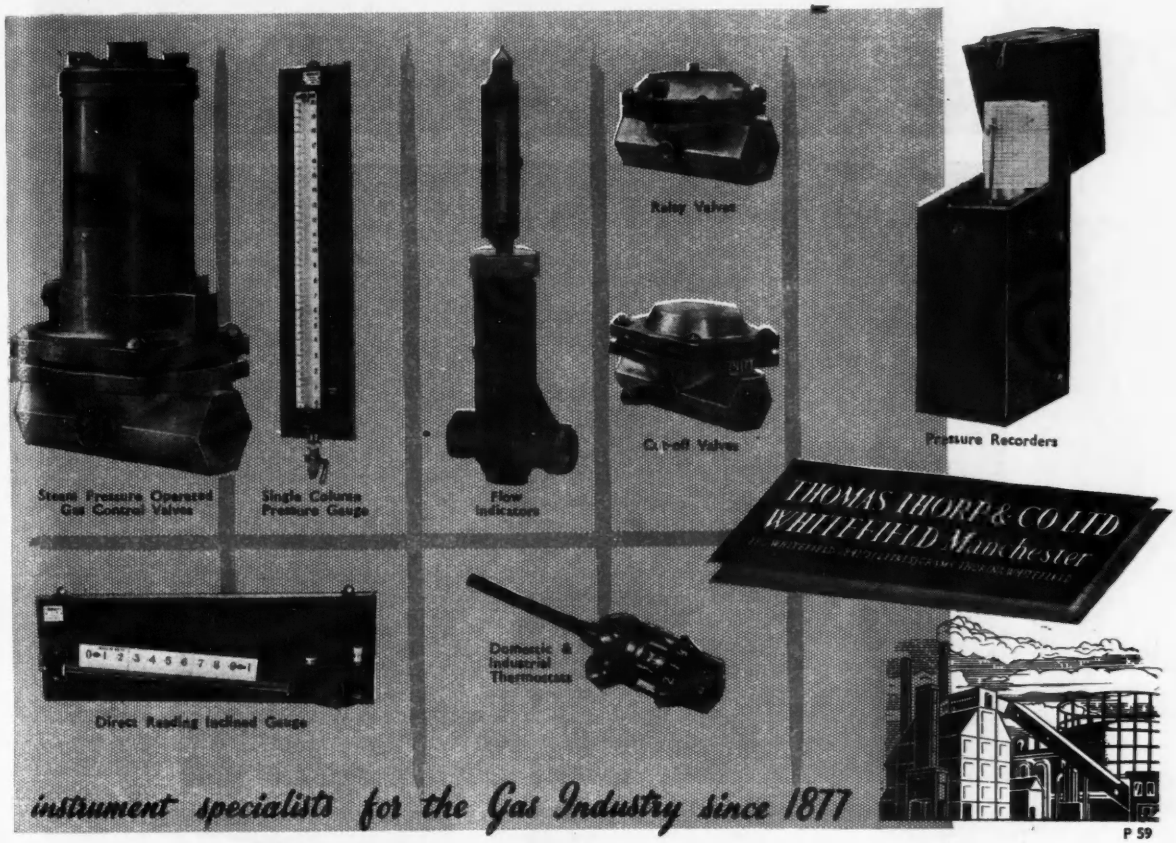

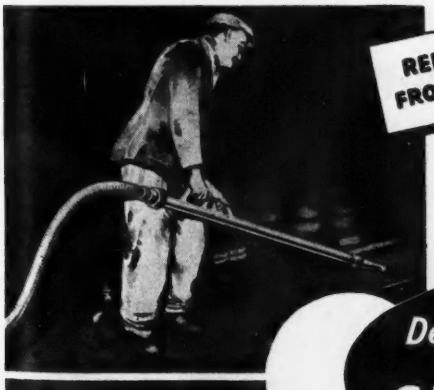

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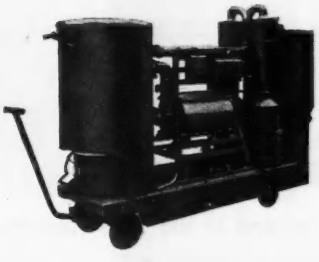

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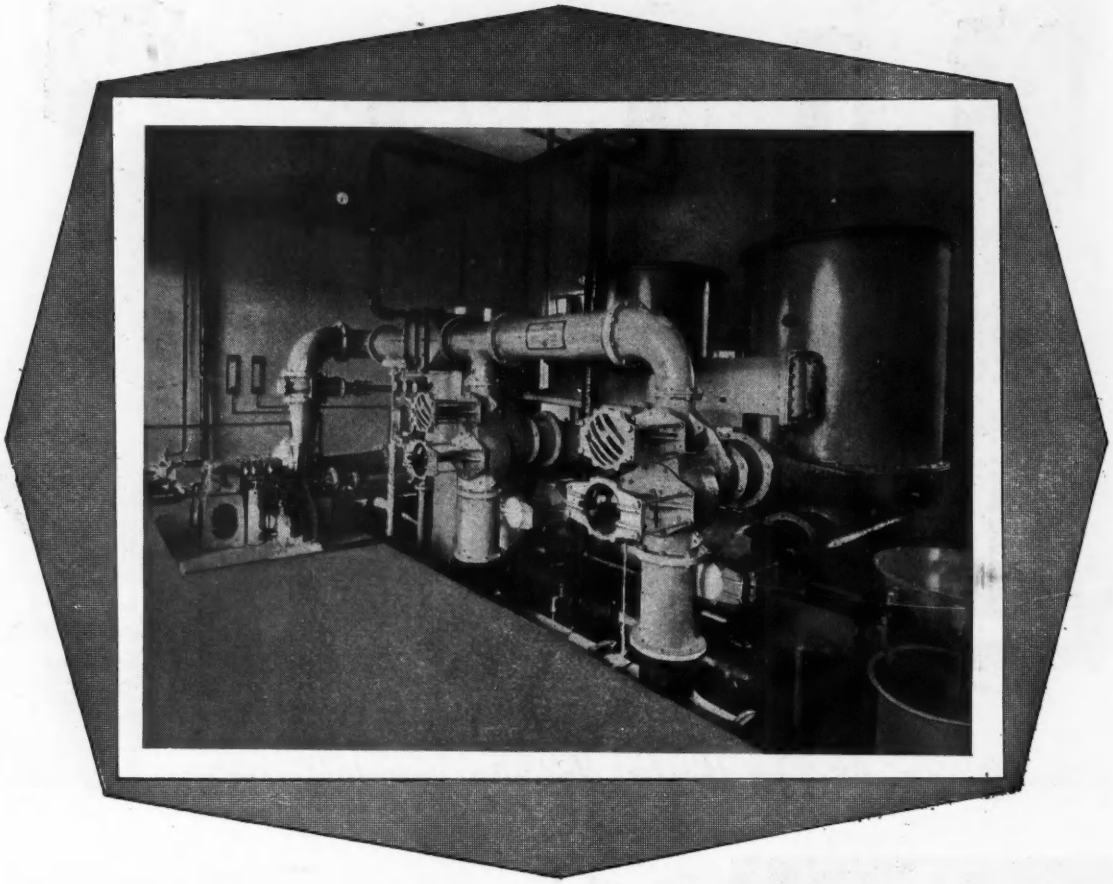

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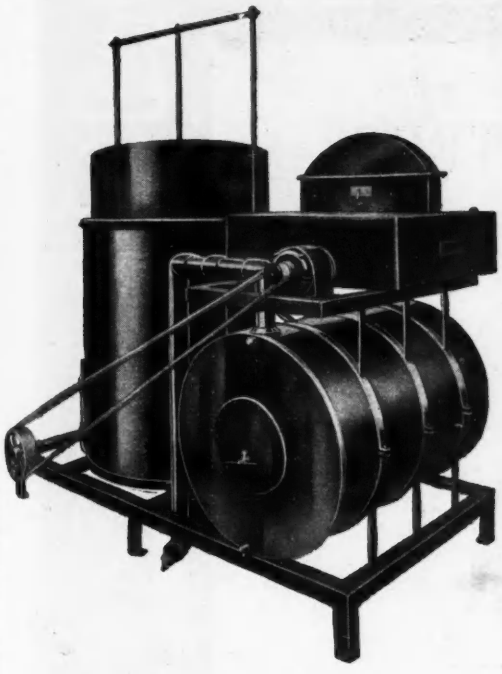

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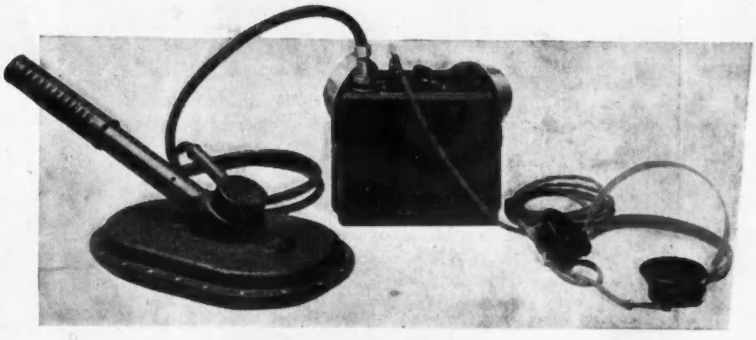

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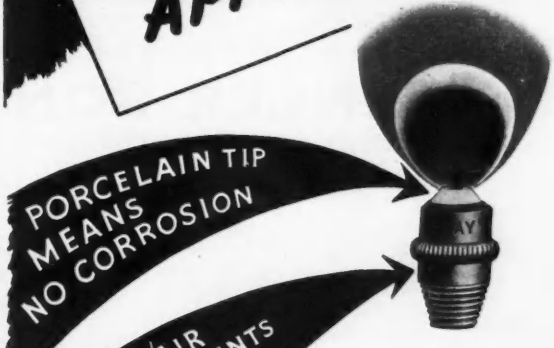

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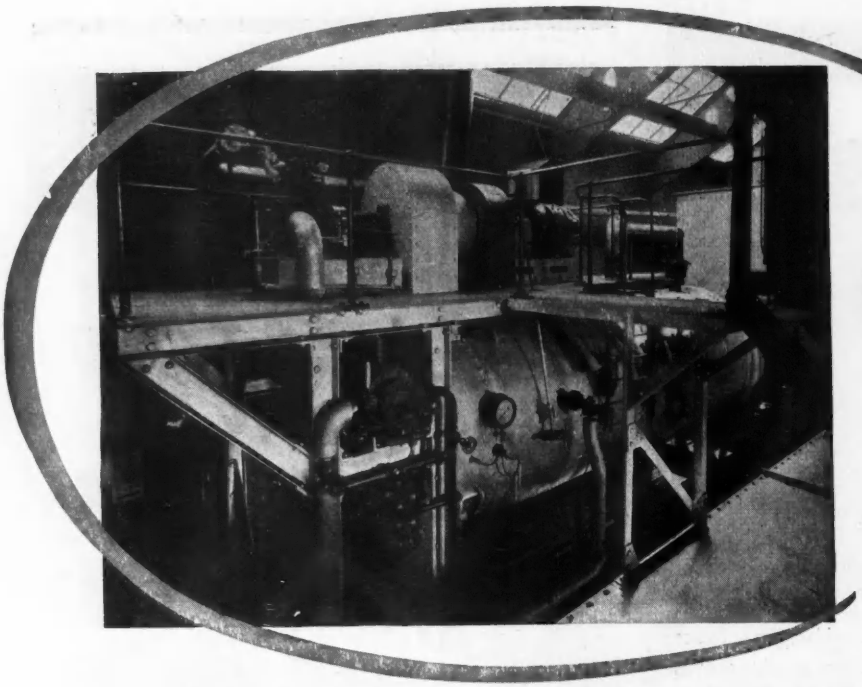

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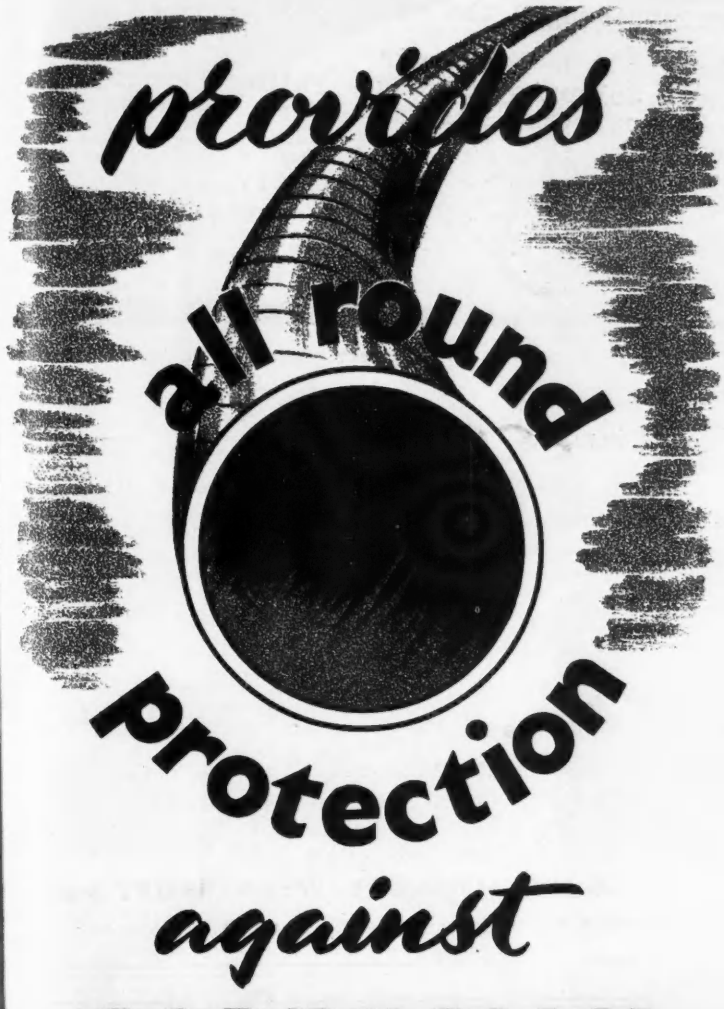

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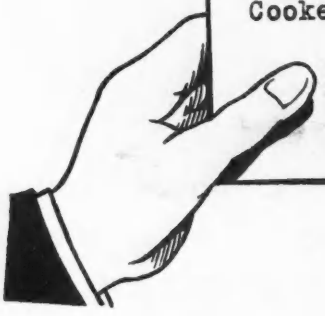

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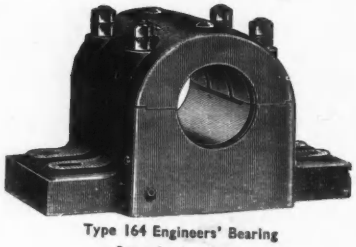

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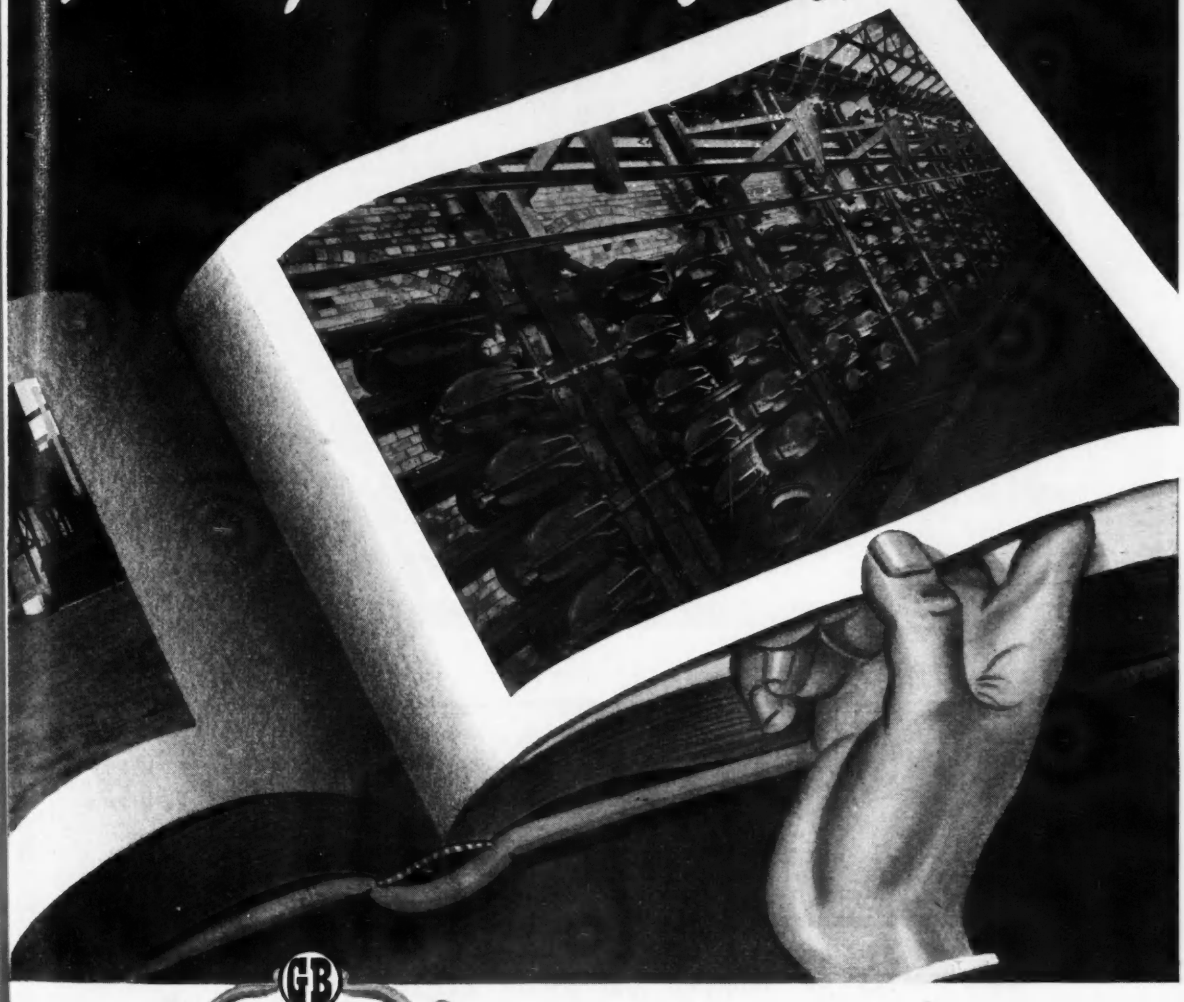

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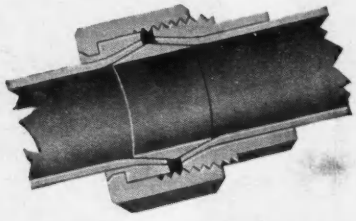

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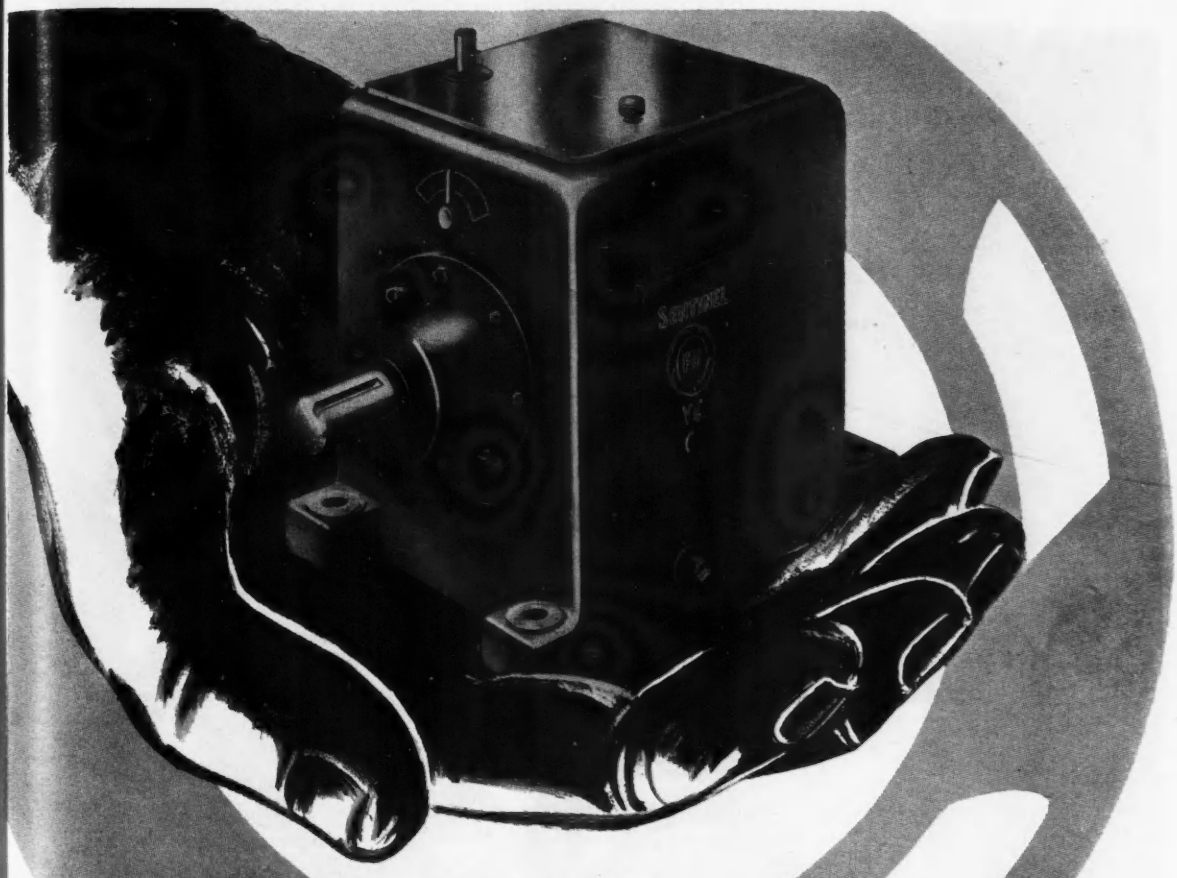

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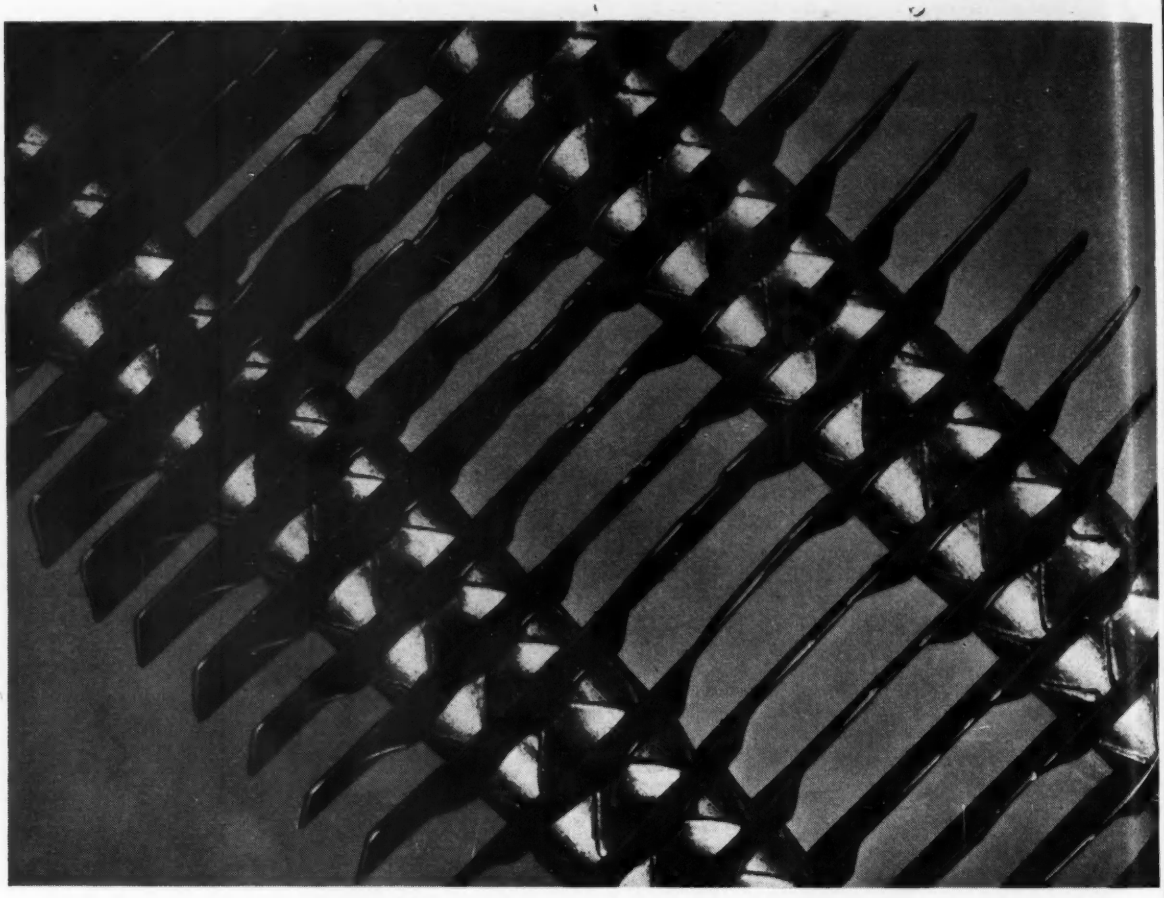

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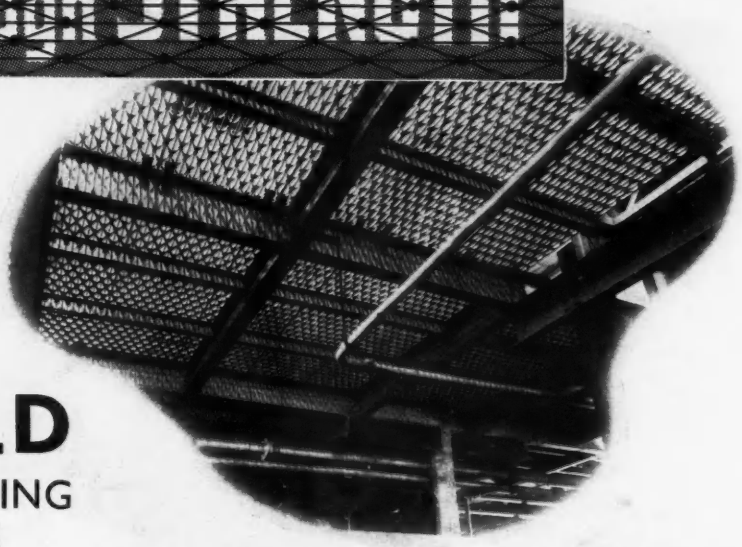

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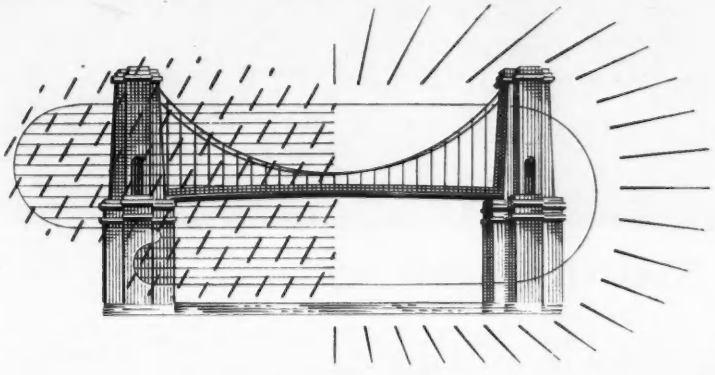

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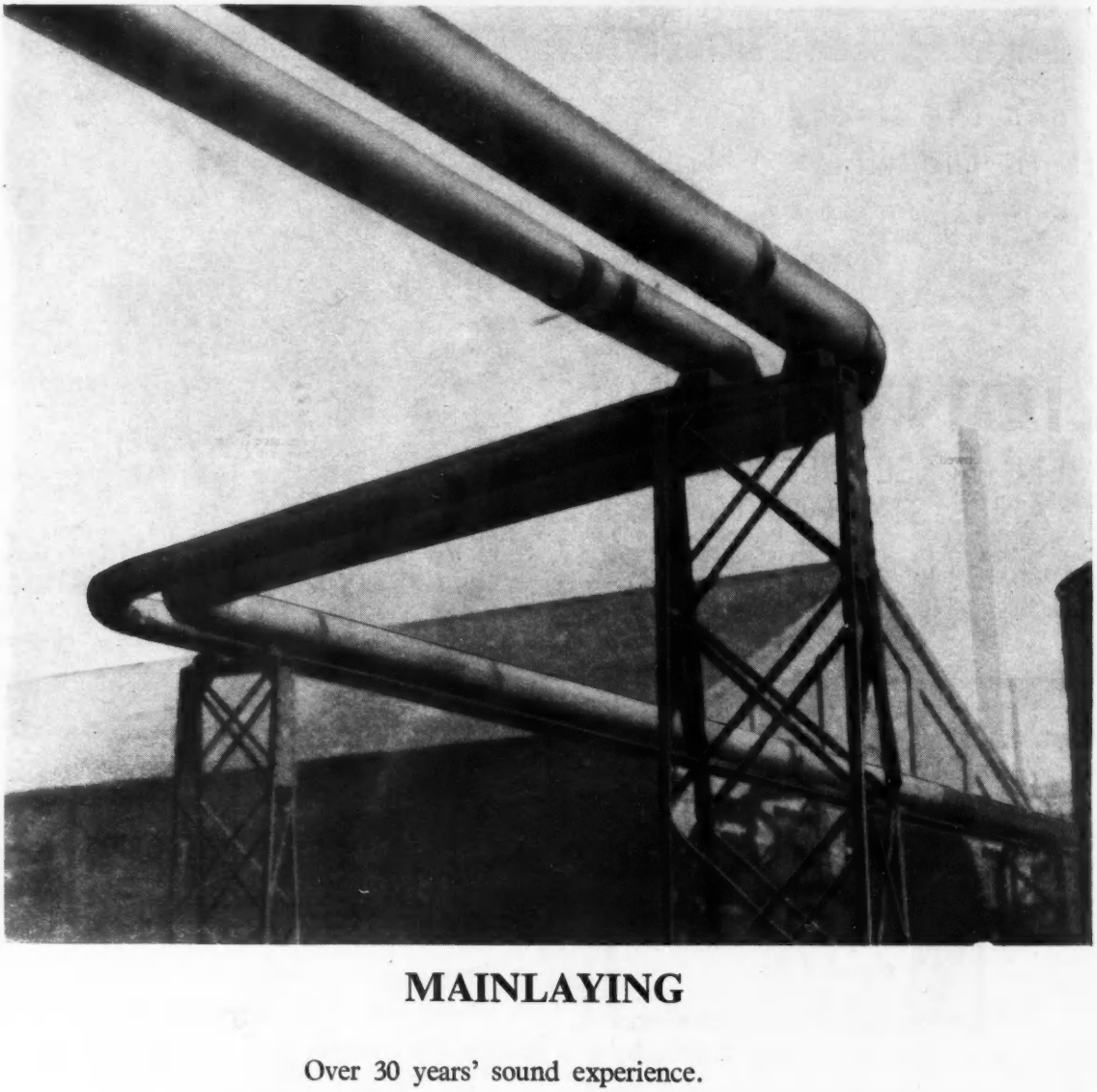

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INDEX TO 'JOURNAL' ADVERTISERS

PAGE

A

A.C.E. Machinery, Ltd. ... ...
Abbott, Birks & Co., Ltd. ... ...
Accurate Recording Instrument Co. ... ...
Acme Wringers, Ltd. ... ...
Aerogen Co., Ltd. 77
Alder & Mackay, Ltd. 95
Ascot Gas Water Heaters, Ltd. ... ...
Ascot Gas Water Heaters, Ltd. (F.A. Neat) Cover IV
Ashmore, Benson, Pease & Co., Ltd. ... ...
Ashworth & Parker, Ltd. ... ...
Aspinall's (Paints), Ltd. ... ...
Associated Lead Manufacturers, Ltd. ... ...
Associated Lead Manufacturers, Ltd. (Rustodian)
Automatic Telephone & Electric Co., Ltd. ...
Automotive Products, Ltd.... ... ...
Averill C. R., Ltd. 91

B

Bagnall, W. G., Ltd. ... ...
Bailey, Sir W. H., & Co., Ltd. ... ...
Bale & Church, Ltd. S2
Balfour, Henry, & Co., Ltd. ... ...
Begwaco Meters, Ltd. ... ...
Bell's Asbestos & Engineering, Ltd. ... ...
Benham & Sons, Ltd. ... ...
Birtley Co., Ltd. ... ...
Blakeley, Firth, Sons & Co., Ltd.... ... ...
Booth, John & Sons (Bolton), Ltd. ... ...
Bottomley, Thomas, (Grids), Ltd. ... ...
Boydell, E., & Co., Ltd. ... ...
Bratt, Colbran, Ltd. ... ...
Bray, George, & Co., Ltd. 83
Bray, W. E., & Co., Ltd. ... ...
Bridges, S. W. & Co., Ltd. ... ...
Bright, Son & Co. (Clerkenwell), Ltd. S2
Bristol's Instrument Co., Ltd. ... ...
British Flint & Cerium Manufacturers, Ltd. ...
British, Foreign & Colonial Automatic Light Controlling Co., Ltd. ... ...
British Furnaces, Ltd. ... ...
British Gas Purifying Materials Co. ... ...
British Jeffrey Diamond, Ltd. ... ...
British Oxygen Co., Ltd. ... ...
British Paints, Ltd. ... ...
British Thomson Houston, Ltd. ... ...
British Tyre and Rubber Co., Ltd. ... ...
British Vacuum Cleaner & Engineering Co., Ltd. 75
Broadbent, J. C., & Co., Ltd. S4
Broadbent, Thomas, & Sons, Ltd. 80
Brockhouse Heater Co., Ltd. ... ...
Broom & Wade, Ltd. ... ...
Brotherhood, Peter, Ltd. ... ...
Brown, J., & Co., Ltd. S2
Bugden, Thos., & Co. ... ...

C

Cambridge Instrument Co., Ltd. ... ...
Cannon Iron Foundries, Ltd. ... ...
Carron Co. ... ...
Cementation Co., Ltd. ... ...
Chance Bros., Ltd. 79
Chemical Engineering & Wilton's Patent Furnace Co., Ltd. ... ...
Chemical & Insulating Co., Ltd. 123
Cinema-Television, Ltd. 81
Clapham Bros., Ltd. ... ...
Clayton, Son & Co., Ltd. 77
Clifford Engineering Co., Ltd. ... ...
Clough (Croydon), Ltd. ... ...
Cochran & Co., Annan, Ltd. ... ...
Collins, Thomas, & Co., Ltd. ... ...
Concrete Proofing Co., Ltd. ... ...
Consolidated Pneumatic Tool Co., Ltd. ... ...
Cowper Penfold & Co., Ltd. ... ...
Cox & Danks, Ltd.... ... ...
Crane, Ltd. ... ...
Crone & Taylor, Ltd. ... ...
Crossley Bros. ... ...
Curtis, Algernon Lewin S2
Cutler, Samuel, & Sons, Ltd. ... ...
Cuxson Gerrard & Co., Ltd. ... ...

D

Decel Engineers, Ltd. ... ...
De la Rue, Thomas, & Co., Ltd. (Potterton Gas Division) ... ...
Dempster, R. & J., Ltd. 65
Dempster, Robert, & Sons, Ltd. 116
Derbyshire Silica Firebrick Co., Ltd. ... ...
Dewrance & Co., Ltd. ... ...
Diaphragm & General Leather Co., Ltd. ...
Dick, R. & J., Ltd. ... ...
Donkin (The Bryan) Co., Ltd. ... ... Cover II
Douglas, Robert M., (Contractors), Ltd. ... ...
Douglas, William, & Sons, Ltd. ... ...
Drakes, Ltd.... ... ...
Drew, H. B., Ltd. ... ...
Dunlop & Ranken, Ltd. ... ...

E

E.B. Refractory Cement Co., Ltd. S2
Edgar, William, & Son, Ltd. ... ...
Electroflo Meters Co., Ltd. ... ...
Electrolux, Ltd. ... ...
Elliott Bros. (London), Ltd. ... ...
Erskine, Heap & Co., Ltd.... ... ...
Ether, Ltd. ... ...
Evans, Joseph, & Sons (Wolverhampton), Ltd. ...
Evershed & Vignoles, Ltd.... ... ...
Ewart Chainbelt Co., Ltd. ... ...
Ewart & Sons, Ltd.... ... ...
Expanded Metal Co., Ltd.... ... ...

PAGE

F

Falk Stadelmann & Co., Ltd. ... ...
Fibreglass, Ltd. 66
Filtrators, Ltd. 72
Flavel, S., & Co., Ltd. ... ...
Fluxite, Ltd.... ... ...
Four Oaks Spraying Machine Co., Ltd. ... ...
Franki Compressed Pile Co., Ltd. ... ...
Fraser & Chalmers, Engineering Works ... ...
Fry's Metal Foundries, Ltd. 90
Fyffe & Co., Ltd. ... ...

G

Gas Chambers & Coke Ovens, Ltd. ... ...
Gas Purification & Chemical, Ltd. S2
General Descaling Co., Ltd. ... ...
General Gas Appliances, Ltd. ... ...
Gibbons Bros., Ltd. 87
Gibbons (Dudley), Ltd. 63
Gimson, J., & Co. (1919), Ltd. ... ...
Glover, George, & Co., Ltd. 78
Glover, Thomas, & Co., Ltd. 96
Goodacre, William, & Sons, Ltd. 80
Goodall Clayton & Co., Ltd. ... ...
Goodyear Mechanical Goods ... ...
Grant, David, & Co., Ltd.... ... ...
Graphite Products, Ltd. ... ...
Green & Boulding, Ltd. S2
Guest, Keen & Nettlefolds (Cwmbran), Ltd. ...

H

Hamilton, A. H., & Co., Ltd. ... ...
Hardman & Holden, Ltd. ... ...
Harris & Pearson, Ltd. 86
Harrisons (London), Ltd. S2
Harvey, G. A., & Co. (London), Ltd. ... ...
Hawkins, W. T., & Co. ... ...
Heaths (Eccles), Ltd. S1
Hayward Tyler, & Co., Ltd. 67
Helliwells (Treforest), Ltd. ... ...
Hewitt Construction Co., Ltd. ... ...
Hickson's Timber Impregnation Co. (G.B.), Ltd.
Hilmor, Ltd.... ... ...
Holden & Brooke, Ltd. ... ...
Holmes, W. C., & Co., Ltd. S5
Honeywell-Brown, Ltd. ... ...
Hopkinsons, Ltd. ... ...
Horseley Bridge & Thomas Piggott, Ltd. ...
Horstmann Gear Co., Ltd.... ... ...
Howden, James, & Co., Ltd. ... ...
Hughes, F. A. & Co., Ltd. ... ...
Humphreys & Glasgow, Ltd. 94

I

Ideal Boilers & Radiators, Ltd. ... ...
I.C.I. Metals, Ltd. ... ...
Incandescent Heat Co., Ltd. ... ...
Ingham, John, & Sons, Ltd. ... ...
International Coin Counting Machine Co., Ltd.
International Combustion, Ltd. 71

J

Jeavons, E. E., & Co., Ltd. 92
Jeavons Engineering Co. ... ...
Jenkins, W. J., & Co., Ltd. ... ...

K

Keay, E. C. & J., Ltd 78
Keith Blackman, Ltd. S6
King, Walter, Ltd. S2,S3
Kings Patent Agency, Ltd.... ... ...
Kirk & Co. (Tubes), Ltd. ... ...
Kirkham Hulett & Chandler, Ltd. 88
Kleen-e-ze Brush Co., Ltd. S1
Kleenoff Co.... 82
Klinger, Richard, Ltd. ... ...

L

LaFarge Aluminous Cement Co., Ltd. ... ...
Laidlaw, R., & Son (Edin.), Ltd. ... ...
Lamont, James H., & Co., Ltd. 88
Lancashire Dynamo & Crypto, Ltd. ... ...
Lawler, Ayers & Co., Ltd.... ... ...
Lead Industries Development Council ... ...
Le Bas Tube Co., Ltd. ... ...
Leeds X.L. Fire Cement Co. ... ...
Lionweld, Ltd. 91
Lind, Peter, Ltd. ... ...
Londex, Ltd. ... ...

M

Macpherson, Donald, & Co., Ltd. ... ...
Magnetic Valve Co., Ltd. ... ...
Main, R. & A., Ltd. ... ...
Mavor & Coulson, Ltd. ... ...
Meltham Silica Fire Brick Co., Ltd. ... ...
Messenger & Sons, Ltd. ... ...
Meters, Ltd.... ... ...
Metropolitan Leather Co., Ltd. ... ...
Milnes Meters, Ltd. ... ...
Mitchell, H., & Co.... 80
Morris Commercial Cars, Ltd. 74

N

Nash & Thompson, Ltd. ... ...
National Benzole Co., Ltd. ... ...
Neil & Spencer, Ltd. ... ...
Newton Chambers & Co., Ltd. ... ...
Niagara Screens (G.B.), Ltd. 82
Nordac, Ltd. ... ...
Nu-Swift Engineering, Ltd. ... ...

O

Orme, Evans & Co., Ltd. ... ...
Oxley Engineering Co., Ltd. ... ... Cover II

P

Parkinson & Cowan (Gas Meters), Ltd. 73, 96
Parkinson Stove Co., Ltd. ... ...
Pass, E. & Co., Ltd. ... ...

PAGE

Peckett & Sons, Ltd. ... ...
Peebles & Co., Ltd.... ... ...
Perl Controls, Ltd. ... ...
Platt, Samuel, Ltd. 86
Power Gas Corporation, Ltd. ... ...
Powers-Samas Accounting Machines (Sales), Ltd. ...
Press, William, & Son, Ltd. ... ...
Pulsometer Engineering Co., Ltd.... ... ...

R

Radiant Heating, Ltd. ... ...
Radiation, Ltd. 114, 115
Rawlplug Co., Ltd. ... ...
Reavell & Co., Ltd.... ... ... S2
Riley, A. J., & Son, Ltd. ... ...
Royles, Ltd. ... ...
Rozalex, Ltd. ... ...
Russell, R., & Sons, Ltd. ... ...

S

S. & F. Contracting Co., Ltd. ... ...
Salter, T. E., Ltd. ... ...
Saunders, H. A., Ltd. ... ...
Scottish Non-Ferrous Tube Industries, Ltd. ...
Sentinel (Shrewsbury), Ltd. 89
Siebe Gorman & Co., Ltd. ... ...
Sigma Instrument Co., Ltd. ... ...
Simon-Carves, Ltd.... ... ...
Simon, Richard, & Sons ... ...
Sisson, W., & Co., Ltd. ... ...
Slingsby, W., & Co., Ltd. S1
Smith Meters, Ltd. ... ...
Spencer Bonecourt, Ltd. 84
Sperryn & Co. ... ...
Standard Furnace & Setting Co., Ltd. ... ...
Stanton Ironwork Co., Ltd. 126
Staveley Iron & Chemical Co., Ltd. ... ...
Steel Equipment Co., Ltd.... ... ...
Stein, John G., & Co., Ltd. ... ...
Stewart & Gray, Ltd. ... ...
Stewarts & Lloyds, Ltd. ... ...
Stoves, Ltd. ... ...
Strachan & Henshaw, Ltd. ... ...
Stringer Bros. ... ...
Sugg, William, & Co., Ltd. 83
Sutcliffe Speakman & Co., Ltd. 76
Sutherland, A. G., Ltd. ... ...
Swallow Coachbuilding Co. (1935), Ltd. ... ...

T

Tarslag, Ltd. ... ...
Taylor, F., & Sons, Ltd. ... ...
Thermo Control Installations, Ltd. ... ...
Thomas & Bishop, Ltd. ... ...
Thomas (Richard) & Baldwins, Ltd. ... ...
Thompson, John, Conveyor Co. ... ...
Thorp, Thomas, & Co., Ltd. 75
Tully, Sons & Co., Ltd. ... ...
Turners Asbestos Cement Co., Ltd. ... ...

U

Ufix Boiler Co., Ltd. ... ...
Underpressure Engineering Co., Ltd. ... ...
United Kingdom Construction & Engineering Co., Ltd. ... ...

V

Vale, Thomas, & Sons, Ltd. ... ...
Vanda Meters, Ltd.... ... ...
Visco Engineering Co., Ltd. ... ...
Vulcan Stove Co., Ltd. 84

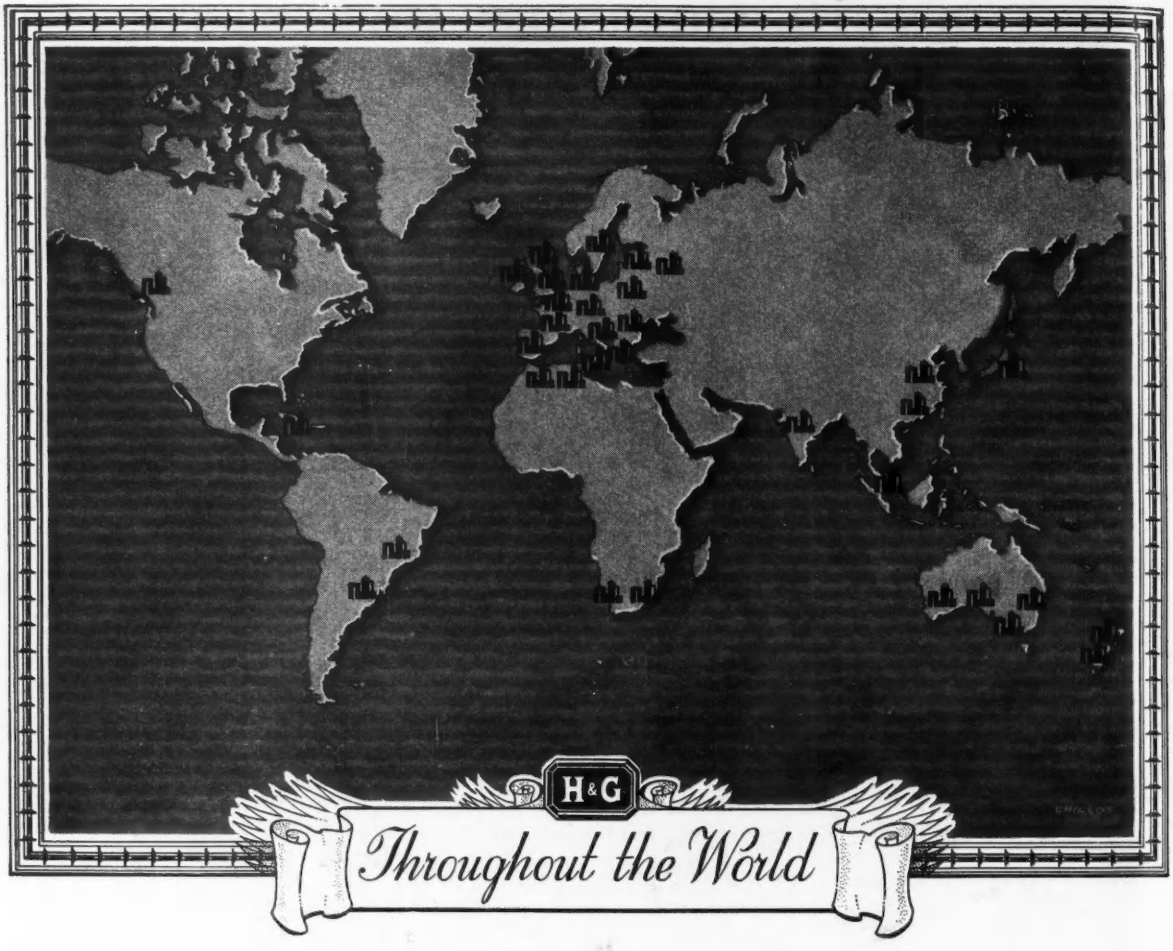
W

W.D. (Sheeters), Ltd. S2
Wailes Dove Bitumastic, Ltd. ... ...
Wakefield, C. C., & Co., Ltd. ... ...
Wakelin, F. H., Ltd. ... ...
Walker, C. & W., Ltd. ... ... Cover I
Walker, Crosweller & Co., Ltd. 126
Waller, George, & Son, Ltd. ... ...
Ward, Thos. W., Ltd. 124
Wellington Tube Works, Ltd. ... ...
Wellman Smith Owen Engineering Corpn., Ltd. ... ...
West's Gas Improvement Co., Ltd. ... Cover III
West Hunwick Silica & Firebrick Co., Ltd. ...
West's Piling & Construction Co., ...
Westwood & Wrights, Ltd. ... ...
Whessoe, Ltd. 69
Whitehouse, Wm., & Co., Ltd. ... ...
Whittaker Ellis, Ltd. ... ...
Wilkes, A. H., & Co., Ltd. S6
Willey & Co., Ltd. 70
Williams, John E., Ltd. 86
Williamson Cliff, Ltd. ... ...
Wilson, George, Gas Meters, Ltd. ... ...
Winn & Coales, Ltd. 85
Woodall-Duckham Vertical Retort & Oven Construction Co. (1920), Ltd. 113
Wood, Hugh, & Co., Ltd. ... ...
Wright, Alexander, & Co., Ltd. ... ...

Y

Yorkshire Copper Works, Ltd. ... ...

Appointments Vacant S3, S4
Appointments Wanted ... ...
Business For Sale ... ...
Contracts Open ... ...
Educational S2
Financial ... ...
Miscellaneous ... ...
Patents ... ...
Plant For Sale & Wanted S2
Publications ... ...
Repairs S2



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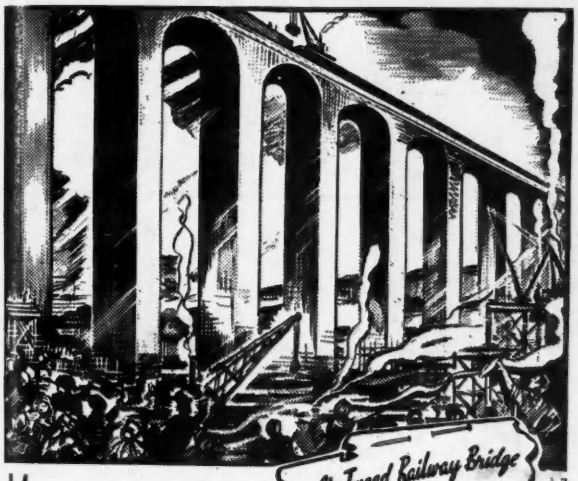

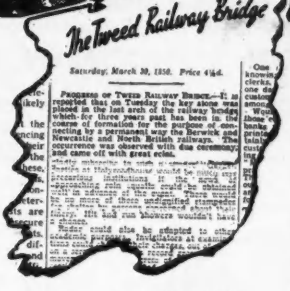
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Saturday, March 30, 1850. Price 4½d.

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Excerpt from "THE SCOTSMAN," Saturday, March 30, 1850.

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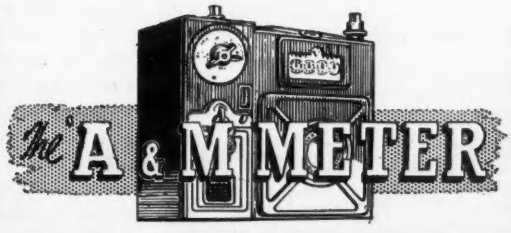

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Gas Journal

103rd YEAR OF PUBLICATION

EDITOR: NORMAN S. SMITH, B.Sc.(Gas Eng.)

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Telephone: CENtral 2236-7.
Telegrams: Gasking, Fleet.

VOL. 265 NO. 4571 JANUARY 10, 1951

CONTENTS

Page

EDITORIAL COMMENT

Peak Load Gas	97
Sulphate of Ammonia	98
Promotional Publicity and Shortages	98
The Building Centre	99
Iron and Steel Scrap S.O.S.	99
The Coal Situation	99
Indigestibles	99

NEWS OF CURRENT EVENTS

Personal	100
Obituary	100
Diary	101
Advertisement Lighting Banned	101
New British Standards	101
New Showroom at Largs	102
Rival Industries Meet at Christmas Luncheon	102
Society of Chemical Industry	102
Economy Urged	102
Gas Helps to Publicise Wales	103
Wage Increases	103
North Thames Gas Sales	103
Cambridge Cookery Demonstrations	103
Trade News	104
Sulphate of Ammonia Propaganda: New World Records in Production and Consumption	106
Sports Club Success	107
North Eastern Gas Consultative Council	107
Pembroke Window Display	107
Area Boundaries	125

TECHNICAL RECORD

Recovery of Pure Sulphur from Coal Gas. By E. Johnson, B.Sc., Ph.D., F.R.I.C., Gas Research Fellow	108
Town Gas from Petroleum Oil. By H. Stanier, M.A., F.R.I.C. (Chief Chemist), and J. B. McKean, B.Sc., M.Inst.Gas E., A.R.I.C., A.M.I.Chem.E. (Chemical Engineer), South Eastern Gas Board	111
Education in the Gas Industry: Discussion on 27th Report of the Institution of Gas Engineers' Education Committee	120

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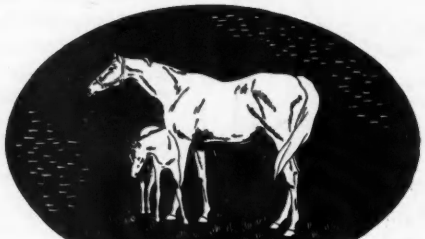

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GAS JOURNAL

VOL. 265. No. 4571 103RD YEAR JANUARY 10, 1951

PEAK LOAD GAS

THE shadow of a crisis in coal supplies imparts a more than usual interest to Communication No. 375 of the Institution of Gas Engineers on the production of town gas from petroleum oils. Even if we succeed in persuading the Minister to get down to a national fuel policy, thereby getting rid of some of the more idiotic anomalies which lead to the present waste of our coal resources, we cannot get rid of the fear that the expansion of the demand for gas may one day outstrip available supplies of gas-making coals. And there will still remain some formidable problems, among which the peak loads inseparable from the satisfaction of the demand for space heating may be the most troublesome. The low load factor of space heating is strikingly shown by the figures quoted by Messrs. Stanier and McKean in their paper. 'For the generality of gas business, excluding the heating load, annual sales equivalent to 240 maximum days may be expected, whereas the full space heating load gives an annual sales equivalent of only about 100 maximum days.' And then there is the significant remark that space heating confined solely to topping up (such as might arise in a so-called district heating scheme) may give a worse load factor still.

It would be fortunate if the recent developments in the petroleum industry should provide a solution to these problems. The trend is towards shipping the crude oil to the industrial centres of the world and there refining it. In this way not only are the refined spirits and oils produced within the market for them, but there remains a substantial quantity of heavy oil at relatively low cost which should certainly be regarded as a welcome supplement to our indigenous coal supplies. Indeed, if the process, more than foreshadowed in this excellent paper, fulfils its promise the residual oil of the petroleum refineries operating in this country may more than suffice not only to cover these peak loads at a reasonable cost, but to provide an effective alternative for gas-making in those numerous isolated small units where coal distillation is expensive and yet where supplies of gas from outside sources cannot be cheaply or conveniently made available. The technical and economic advantages of such a process are obvious. The capital cost of the apparatus is likely to be so much lower as to compensate for some enhanced cost of gas-making materials. It will be quicker and easier to install, occupying much less ground area than carbonising plant. It will be quicker to bring into and take out of commission, and it is possible that purification costs will be lower. Its success depends on the successful design and operation of plant which shall produce, with the heavy residual oil of the petroleum refinery as the raw material, a gas of density and calorific value so nearly equal to those of ordinary town gas that it can be introduced into the supply system without upsetting the functioning of appliances.

The story of the steps by which the evolution of a most promising process has been built up from the laboratory, through the pilot plant, to the design and completion of a full-scale experimental plant is admirably told in this paper. The work started with the gas oil which has long been used in the enrichment of water gas. Apart from the use of coke (a commodity itself to be conserved) this well-established method of meeting the peak demand is suffering from the high and rising cost of gas oil. The first move, however, was to devise means of making gas direct from this class of oil. There were processes of this kind in the field, but none of them produced a gas sufficiently similar to coal gas. Straight pyrolytic cracking leads to excessive free carbon. The line of attack was that of gasification in steam. The reaction of steam with carbon is too slow to keep up with the formation of carbon in the cracking process, but it was possible that it could be speeded up in the presence of a suitable catalyst.

A whole series of catalysts was investigated and it was shown in the laboratory that catalytic gasification in steam, with an alkaline carbonate or an alkaline earth oxide as catalyst, some form or compound of lime, in short, should provide a satisfactory means of controlling the deposition of free carbon in the production of a gas low in unsaturated hydrocarbons and rich in hydrogen, suitable for distribution as town gas. The next step was to produce the catalyst in a condition suitable for use in a working plant. It must be prepared in pieces large enough and

mechanically strong enough to stand handling and large enough, too, not to offer a great resistance to the flow of gas. Finally, a mixture 34 parts of calcium carbonate, 63 parts of bauxite, and three parts of bentonite, moulded into hollow cylinders, 1¼ in. dia., 1¼ in. long, and ¼ in. bore, burned off at 1,350°C., was found to combine the required qualities of stability and activity.

The process adopted, after reluctantly (one feels) turning down the possibilities of fluidisation, was that of 'blow and run,' at time intervals not unlike those of carburetted water gas. The pilot plant was of quite sizeable dimensions and the results with heavy oils were most encouraging, as good as those obtained from the more expensive gas-oil. It appears highly probable that the experimental plant now under construction will realise, in simple plant, a yield of 1.25 therms of gas at 500 B.Th.U. per cu.ft. per gallon of heavy oil, equivalent to 300 therms per ton. When it is realised that some 5 mill. tons of such oil will eventually be available, it will be seen that there will be no shortage of the necessary raw material for this process. The thermal efficiency of the process in the pilot plant reached 60% and it is considered that this will be improved to 70% or more in a large commercial plant. In such a plant it will be possible to make the process self-supporting in heat and power requirements. And it is anticipated that at the present prices of heavy fuel oil gas will be produced at a price comparable with that of base-load coal gas.

The publication of this work is fully justified, even though it is not yet complete. It is to be hoped that the responsible authorities will press it forward to completion. The tone of the phrase 'inclusion in the research programme of the industry' is a little chilling. The new experimental plant is expected to be working at an early date. It is satisfactory that it will have a capacity of 1 mill. cu.ft. per day, but there is an air of improvisation about it, 'constructed from materials readily available.' We trust that nothing vital has been sacrificed and that the results will provide the data for the construction of yet another plant in which nothing will be spared to give the new process the maximum chance of success. One pictures a plant consisting of a number of large cylindrical vessels, catalyser chamber, heat interchangers and a waste heat boiler, the raw materials flowing from tanks through pumps and pipes without the dust inseparable from coke handling—fully instrumented and lending itself to automatic control—operated by a technician in his white coat!

SULPHATE OF AMMONIA

ALTHOUGH still substantially less than half the total for 20 years ago, exports of sulphate of ammonia from the United Kingdom in 1949-50 were some 15% higher than in the previous year, and at 280,899 tons were only 40,969 tons short of the figure for the last complete pre-war year. All but a very small proportion of Britain's output is produced by the gas and coking industries, and it is of interest to note from the 30th annual report of the British Sulphate of Ammonia Federation, covering the 12 months ended June 30 last, that the total United Kingdom production reached 924,500 tons, an increase of 22,500 tons over the previous year, of which 748,115 tons were accounted for by home agricultural consumption, compared with 593,779 tons for 1948-49. The largest purchasers overseas were, as usual, India, Pakistan, and Burma (46,882 tons against 55,553 tons for the previous year); Ceylon (32,806 tons against 35,335 tons); Australia and New Guinea (31,401 tons against only 7,787 tons in the previous year); and British West Indies (29,247 tons against 29,356 tons).

Propaganda work has been carried on successively by the Federation and its predecessors for a period of 53 years, and although the present report does not make any sensational disclosures it shows that the value of sulphate of ammonia is being increasingly recognised by farmers and that propaganda, advertisement, educational literature, and demonstrations are all paying dividends. Five years ago Imperial Chemical Industries, Ltd., as agents for the Federation, laid plans for the development of grassland as a large new market for sulphate of ammonia and began collecting data by accurate measurement on a farm scale in a number of counties. The information thus obtained is now becoming available for purposes of propaganda and demonstration, and the report states that while full use continues to be made of the older forms of propaganda greater emphasis can now be put on demonstrations at farms of methods for obtaining early grazing, and for controlling grazing. Arrangements are now in hand to provide at least two farm demonstration centres in every county by next year.

Since 1940 prices of sulphate of ammonia to farmers have been pegged and producers have received a subsidy on home agricultural sales to cover increases in cost not included in the price. To cover increased railway freight rates there have been three authorised increases since July, 1946, bringing the spring price up to £10 12s. per ton against £10 2s. four years ago. In 1930-31 the spring price was £9 10s. per ton, and two years later it fell to as low as £6 10s.

PROMOTIONAL PUBLICITY AND SHORTAGES

MANY consumers have failed to understand why electricity continues to be advertised at a time when acute shortage of current prevails. The difficulty—indeed, embarrassment—in which our sister industry finds herself at the moment is reflected in the decision by the South Eastern Electricity Board to discontinue all its promotional publicity campaigns. It should be recognised that there is little capital to be made by the gas industry out of electricity's predicament; if every consumer who is seriously inconvenienced by load-shedding turned to gas we should very soon find ourselves in similar straits. This question of publicity in times of shortage is an exceedingly difficult one and raises a lot of very searching questions. Is it better to stop advertising goods in short supply lest we antagonise potential customers and drive them into buying something else? Do we in fact lose a customer in the future because he cannot obtain our advertised product now? Do we subscribe to the theory (very widely held) that one must keep one's products constantly before the public eye even if they are unobtainable? Of this theory we had many examples during the war. Is there any point in discontinuing promotional publicity so long as appliance manufacturers continue to advertise their individual goods? It may boil down to a question which can only be settled by each individual unit or division according to its capacity to increase its load—which suggests that in times of excessive demand publicity should be undertaken only at a local level. At the moment there is a shortage of coke, and we are faced with the decision whether or not to soft-pedal for the time being our national publicity on behalf of domestic coke-burning appliances.

THE BUILDING CENTRE

OUR pages have recorded the development of the Building Centre, in the activities of which the gas industry has played and continues to play a major part. Since its inception in 1932 the Centre has occupied premises at 9, Conduit Street, London, but for some time these premises have been inadequate to cope with the Centre's growth. It is good news, therefore, that the Building Centre Council has acquired a building which should meet its needs for some years to come. It is situated in Store Street, off Tottenham Court Road, and has three times the area of that at present in use. The Bloomsbury area is favoured by architects and various professional societies and it is estimated that there are at least 2,000 architects and quantity surveyors and their assistants and students working in the area. Many of the societies and schools, whose members make use of the Centre, are within a few minutes' walk. Apart from the very great increase of space available for exhibits it will be possible to provide a theatre for lectures and film demonstrations and also to allot a considerable area for temporary exhibitions. The building needs certain alterations and repair of war damage and it is not yet possible to say how soon the Building Centre can be transferred.

IRON AND STEEL SCRAP S.O.S.

PRESIDENTS of the British Iron and Steel Federation, Joint Iron Council, and National Federation of Scrap Iron, Steel, and Metal Merchants have addressed a joint appeal to 15,000 users of iron and steel to speed up supplies of scrap. Government departments, public and municipal undertakings, the armed services, and factories have been asked to co-operate by making a thorough search for scrap. The three trade associations hope that not only will the regular collection and dispatch of normal scrap be accelerated but that surveys of plant will be taken with a view to dismantling immediately all obsolete plant. While last year's production of iron and steel established a new record, the maintenance of increased production, the letter points out, depends on larger quantities of scrap being returned to the furnaces. There is capacity for further increase in production, but raw materials are more difficult, and consumers are reminded that every ton of scrap can be made into a ton of new metal. Another aspect of the general metal shortage is emphasised in a memorandum which 5,000 manufacturers and 65 trade associations have sent to the Ministry of Supply claiming that the prohibition on the use of zinc, brass, and copper in a wide range of goods will lead to dislocation and unemployment. The memorandum urges that the Ministry should either extend the period during which the prohibited metals may continue to be used or use its discretion in granting licences to allow manufacturers to use stocks they may still hold after the ban comes into force. It is pointed out that even in those cases where substitute materials can be used it is not possible to make the changeover in anything like a month. It is possible that on January 31 a number of manufacturers will have left in stock some manufactured goods containing prohibited materials which have been specially made to the specification of the particular manufacturer and which cannot be easily used for any other purpose. Where this contention can be proved it is suggested that the department concerned could issue a licence authorising the use of these materials for a specified period. No possible advantage could be gained by compelling manufacturers to hold such materials in stock for an indefinite period.

THE COAL SITUATION

CRISIS follows crisis in the coal industry; in spite of promissory injections at frequent intervals the industry suffers from dangerous relapse. Last Wednesday the Prime Minister appealed to the miners to produce an extra 3 mill. tons of coal by the end of April. In company with Mr. Attlee were the Chancellor of the Exchequer, the Foreign Secretary, the Colonial Secretary, and the Minister of Fuel and Power, and they met the Executive Council of the National Union of Mineworkers. The miners' leaders promised their full co-operation to achieve the aim, and the executive is to meet tomorrow to consider the situation. Output of coal in 1950 (216.3 mill. tons) was over 1 mill. tons more than in 1949, but nearly 2 mill. tons short of the target. Stocks at the end of December were nearly 2 mill. lower than at the same time in 1949. In an official statement after the meeting last week it was stated that the Government is confident that the negotiations at present taking place between the National Coal Board and the National Union of Mineworkers will be continued in a sympathetic spirit. The negotiations arise out of proposals from the union for improvements in conditions with the object of easing the long-term manpower position and such matters as higher wages, pensions, and a second week's holiday with pay. The immediate need would appear to be a continuation of Saturday working and a reduction in the high rate of voluntary absenteeism. There is, of course, another aspect, apart from the drift of manpower from the pits, and that is the efficiency in use of the coal available—a subject which we have discussed at length in these columns. In regard to this we might record that last Wednesday Sir Patrick Dollan, Chairman of the Scottish Fuel Efficiency Committee, stated that unless the Government imposed a ban on all mid-week sport the Committee would discontinue its efforts to secure fuel saving. In the meantime Mr. Noel-Baker has appealed to housewives, both on the radio on Saturday and at the East Midlands Gas Consultative Council last week, to economise in gas and electricity. The outlook is grim and dangerous, and we are drifting.

INDIGESTIBLES

WHILE we must confess it has rarely occurred to us to attempt to make our gas meter do its stuff by inserting our cycling club badge, nor try to get a tiddley wink's worth to heat the nocturnal water bottle, it appears that such devices are used by enterprising, and otherwise honest, consumers to an extraordinarily wide extent. We are not going to assume an air of shocked virtue and say we never imagined such things happened; but we certainly were startled at the variety of indigestible objects which the gas meter seems capable of swallowing and, indeed, thriving on—if we are to believe the facts given in an article on the subject in the Christmas number of the West Midlands Gas Board Magazine. Admittedly its stomach does occasionally rebel at some of the more outrageous bodies thrust down its throat, and a major operation is necessary to remove the resulting stoppage; but it does speak volumes for its sturdy mechanism that it can assimilate such widely assorted oddments as flywheels from watches, tops of door keys, buttons, and mica discs. In fact, it finds the last-named such choice fare that it has been known to produce 10s. worth of gas on a single disc before degorging it into the coin box. Why, we wonder, has the gas meter so catholic a taste? Is it alone in its peculiarity? If one endeavours to deceive a telephone box or a railway ticket machine with anything but strictly legal tender, let alone curtain rings, milk bottle tops, or 'co-op.' tokens, it is hurled back at one with a kind of angry snarl or else it completely jams the mechanism—in either case making one look extremely foolish in the eyes of the queue waiting behind. Many consumers, it appears, use tokens quite openly, and readily pay up their value when the collector calls. More than one harassed mother has kept her infants quiet by giving them buttons to play at posting letters in the gas meter. Some use them only in emergency; others because they are frightened of the meter being robbed and their having to pay twice. Whatever the reason for the 'foreign body,' it must make the meter collector's job of balancing his budget extremely interesting. In one meter was found, for instance, 91 milk bottle tops; in another 65 brand-new metal washers; a third consumer always uses curtain rings and evidently has an inexhaustible supply, for at least thirty or so are found at every clearance. We suppose the collector is provided with ready-reckoners and conversion tables expressing curtain rings in milk-bottle-top-equivalents and reducing C.T.C. badges to terms of tiddley winks per therm.

Personal

Mr. **F. Pearce** has been appointed Executive Director of Kirk and Company (Tubes), Ltd., London, S.E.16.

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Mr. **H. A. R. Binney,** C.B., has been appointed Director and Secretary of the British Standards Institution in succession to the late Mr. Percy Good, C.B.E.

◇ ◇ ◇

Mr. **H. G. Palmer** has resigned from the Deputy Chairmanship of the Imperial Continental Gas Association, while retaining his seat on the Board. His successor as Deputy Chairman is Mr. **S. H. le Roy-Lewis,** O.B.E.

◇ ◇ ◇

Mr. **J. R. W. Alexander,** M.A., LL.B., F.C.I.S., formerly General Manager of the British Gas Council, is serving his second year as senior Vice-President of the Chartered Institute of Secretaries, which is celebrating the Diamond Jubilee of its inception. The new President is Sir **Edward Wilshaw,** elected for a second time after an interval of 20 years.

◇ ◇ ◇

Mr. **J. H. Dakin,** for the past seven years Managing Director of the Modern Transport Co. (Liverpool), Ltd., Coal and Coke Exporters and Contractors, and prominently associated with it since 1921, has found it necessary to resign owing to ill health. Mr. **Kenneth Richardson** (Manager, Leeds Office) and Mr. **Charles W. Parker** (Secretary) have been appointed Joint General Managers and have also been elected to the Board of the Company.

◇ ◇ ◇

Mr. **C. Lindberger** has retired from the position of General Works Manager of Electrolux, Ltd., as from December 31. He has been associated with Electrolux for over 25 years, of which he spent 23 at Luton works. He is remaining in a consultative capacity for the time being, and is succeeded as Works Manager by Mr. **W. R. Lackie,** A.M.I.E.E., who has been Assistant Works Manager since he joined Electrolux in 1947.

◇ ◇ ◇

Mr. **Philip H. Sugg,** after 30 years' service as Chairman and Managing Director of William Sugg and Co., Ltd., has resigned his position as Joint Managing Director with Mr. **W. T. Mattock,** but remains Chairman of the Board, Mr. Mattock being appointed sole Managing Director. Owing to ill health, Mr. **Anthony A. Sugg** has resigned his office as Secretary of the Company, but retains his seat on the Board. To fill the vacancy thus created the Board has appointed Mr. **W. K. Fox** to act in the dual capacity of Secretary and Accountant.

◇ ◇ ◇

Professor Sir **Cyril Hinshelwood,** D.SC., F.R.S. (Dr. Lee's Professor of Chemistry at Oxford University and Chairman of the Fuel Research Board), Sir **Claude Gibb,** F.R.S. (Chairman and Managing Director of C. A. Parsons, Ltd., Newcastle-upon-Tyne), and Colonel **H. C. Smith** (Deputy Chairman of the Gas Council) have been appointed members of the Scientific Advisory Council set up in 1948 to advise the Minister of Fuel and Power on the scientific aspect of his statutory duties. Dr. **E. S. Grumell,** C.B.E., M.I.M.E., and Dr. **H. Hollings,** F.R.I.C., have retired from the Council.

◇ ◇ ◇

Mr. **George A. Matthews,** J.P., Deputy Chairman of the West Midlands Gas Board, has resigned his position owing to ill health, and his resignation has been accepted by the Minister of Fuel and Power with regret and thanks for past services. When he was appointed in the latter part of 1948, Mr. Matthews was Birmingham and Midland Secretary of the National Union of General and Municipal Workers. A native of Burton-on-Trent, he entered the gas industry on leaving school and subsequently served an apprenticeship in engineering with the former Midland Railway at Burton. After the 1914-18 war, in which he served with the Royal Engineers, he rejoined the gas industry, and in 1934 he was elected an officer of the N.U.G.M.W. and moved to Birmingham. From 1936 until 1943 he was Joint Secretary of the Midland Regional Joint Industrial Council for the Gas Industry, and in 1943 he became its Chairman.

Councillor **Bernard Clarke,** M.B.E., J.P., Sub-Divisional Manager of the South Lincolnshire Sub-Division, East Midlands Gas Board, has been appointed Divisional General Manager for Lincolnshire. His promotion, which takes effect on April 1, was announced on New Year's Day, the date on which the conferment of his M.B.E. was gazetted, and marks a re-organisation of the Division. Colonel **J. Kennington,** Sub-Divisional Manager, North Lincolnshire, retires on March 31 and the three sub-divisions will be merged into a new administrative Lincolnshire Division, which will subsequently be divided into groups or districts. Mr. **J. S. Marshall,** at present Sub-Divisional Manager, City of Lincoln, will become Deputy Divisional General Manager, and Mr. **D. W. Ault,** Engineering Assistant at headquarters, will become Divisional Engineer. The headquarters of the new Division will be at Belle Vue House, Lincoln.

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Mr. **B. E. Blackledge,** M.I.CHEM.E, of Port Talbot, who received the M.B.E. in the New Year Honours, is Superintendent of the Coke Ovens and Fuel Departments of the Steel Company of Wales, Ltd. He has had more than 50 years' experience on coke ovens, 38 years of which he has spent as an active Coke Oven Manager. He went to Port Talbot in 1934 and has since been associated with the entire rebuilding of the coke oven plant in 1939 and with the extensions which have been under construction since 1947, which will make the plant one of the biggest in the country. He has also been responsible for the distribution of coke oven and blast furnace gas throughout the whole works, including the new Abbey Works, as well as the instrumentation of all fuel using units. In 1948 Mr. Blackledge was a member of a working party convened to investigate the greater utilisation of coke oven gas in the South Wales Western Area. He is also a member of the Education Committee of the South Wales Fuel Efficiency Committee.

Obituary

The death occurred on December 31 last of Mr. **C. J. B. Gregg,** Director and also Branch Manager of Falk, Stadelmann and Co., Ltd., Glasgow. Mr. Gregg had been Branch Manager since 1914, a local Director of the Company since 1919, and a full Director since 1943.

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JOHN W. McLUSKY

After a number of years of indifferent health, which brought about his retirement in 1947, Mr. John W. McLusky died in an Ayr nursing home on January 5 at the age of 67. He leaves a widow and one son.

One of three brothers who all became gas engineers, Mr. McLusky gained his early training in the works of Messrs. Blackwood and Gordon, Port Glasgow. He began his career in the industry in 1902 at the Renfrew gasworks, where he had experience in the starting of new works. From 1906 to 1908 he was Superintendent of the Barking Gas Company's works (prior to absorption by the Gas Light and Coke Company), where he assisted in the design and erection of several extensions. From 1908 he served for three years under Mr. J. Hughes Cornish (then Engineer, Manager, and Secretary of the Bridgwater Gas Company), and in 1911 secured his first senior appointment as Engineer and Manager at Portrush (Co. Antrim). The year 1915 found Mr. McLusky back in his native Scotland as Manager and Engineer of the Airdrie Corporation Gas Department, but after only two years in this appointment, he was called south of the border to take charge of the Blackburn Gas Department at the comparatively early age of 34. He was destined to remain but a short time in the south, for in 1919 he reached the climax of a varied career in his appointment to the important post of Engineer and General Manager of the City of Glasgow gas department.

Mr. McLusky was President in 1924 of the North British Association of Gas Managers; he was also a member of the Society of Chemical Industry. In 1925, he visited the United States to inspect a number of important gas undertakings. His retirement was marked by a complimentary dinner arranged by members of the Council of the North British Association in honour of both him and the late Mr. J. Jamieson, whose retirement from a similar position at Edinburgh took place about the same time.

Diary

Jan. 12.—London and Southern Junior Gas Association: 'The Performance of Continuous Vertical Retorts,' C. H. Lewis, 178, Edgware Road, W.2, 6.30 p.m.

Jan. 12.—Scottish Junior Gas Association (Western District): 'Concerning Safety,' C. Campbell (Dawsholm). Royal Technical College, Glasgow.

Jan. 13.—Western Junior Gas Association: Visit to Bideford Works and short papers by Student Members.

Jan. 15.—Eastern Gas Consultative Council: Connaught Rooms, 2 p.m.

Jan. 16.—Institute of Fuel: 'Transport and Storage of Coal.' L. Locket. Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 5.30 p.m.

Jan. 17.—Institute of Fuel: 'Low Temperature Carbonisation,' G. S. Pound, Sheffield University, 6.30 p.m.

Jan. 17.—Institute of Fuel: 'Domestic Heating,' J. S. Hales, Institution of Engineers and Shipbuilders, Glasgow.

Jan. 17.—Eastern Gas Board (Cambridge Division) Salesmen's Circle: 'The Divisional Installation Manual,' S. Halls (Distribution Superintendent, Cambridge).

Jan. 19.—Eastern Junior Gas Association: 'About the Works,' L. W. Jarrett (Nottingham). Peterborough.

Jan. 20.—Yorkshire Junior Gas Association: 'Concerning Carbonisation,' R. K. Atkinson (Assistant Works Manager, New Wortley Works, Leeds). Wakefield.

Jan. 24.—Industrial Gas Development Committee: Gas Industry House, 9.30 a.m.

Jan. 24.—London and Southern Junior Gas Association: Visit to the works of Electroflo Meters Co., Ltd., Park Royal.

Jan. 25.—North Thames Gas Consultative Council: Westminster City Hall, Charing Cross Road, 2.30 p.m.

Jan. 25.—Midland Junior Gas Association: Afternoon visit to the works of the Rover Motor Co., Ltd., Solihull.

Jan. 25.—Scottish Junior Gas Association (Western District): Annual Dinner and Dance, Beresford Hotel, Glasgow.

Jan. 29.—West Midlands Gas Consultative Council: Dudley Room, Queen's Hotel, Birmingham, 2.30 p.m.

Jan. 30.—London and Southern Section, Institution of Gas Engineers: 'Water Pollution,' P. Wedgwood, M.SC. (Production Engineer, Watford Division). Institution of Gas Engineers, 17, Grosvenor Crescent, 2.30 p.m.

Feb. 2.—Scottish Junior Gas Association (Western District): Open Discussion Night, Royal Technical College, Glasgow.

Feb. 6.—South Eastern Gas Consultative Council: Adjourned quarterly meeting, Croydon, 2.30 p.m.

ADVERTISEMENT LIGHTING BANNED

The Minister of Fuel and Power has made the Advertisement Lighting (Prohibition) Order, 1951, which came into force on Monday. This Order prohibits the use, for the purpose of advertisement, of lighting which uses electricity, gas, oil, or candles. The only exceptions are the use of electricity obtained from a windmill generator and electricity for the projection of films or slides on screens in theatres and cinemas.

The purpose of the Order, which covers shop window lighting, is to save coal which is required to generate electricity and to make gas. But the use of oil and candles is prohibited as well to prevent a run on these leading to a shortage. Until this Order was made, the only restrictions on advertisement lighting were those imposed by the Electric Lighting (Restriction) Order, 1949 (as amended). This prohibited the use of electricity from the public supply for advertisement lighting between 7 a.m. and 6 p.m. on Mondays to Fridays and its purpose was to reduce load shedding.

NEW BRITISH STANDARDS

Ferrous Pipes and Tubes

Following the publication of B.S. 1500 ('Fusion Welded Pressure Vessels'), the British Standards Institution has just published in one document two Standards, B.S. 1507 and B.S. 1508, 'Ferrous Pipes and Tubes for Pressure Vessels for Use in the Chemical and Allied Industries.'

This document contains a comprehensive range of specifications for pipes and tubes manufactured from 12 types of steel, covering mild steel, alloy steel and austenitic steel. Full details are given of chemical compositions, mechanical properties, methods of test and tolerances in finished pipes and tubes (10s. 6d.).

* * *

Instrument Symbols

The system of instrument symbols described in British Standard for graphical symbols for instrumentation (B.S. 1646: 1950) provides a means of graphical representation suitable for use in any engineering or process-line diagram. It is also suitable for use in engineering and industrial reports and in plant arrangement and layout drawings. The symbols are not primarily intended for use in electrical wiring diagrams, nor are they intended to detail any particular type of instrument or control. The system has been devised in simple form to enable any combination of instruments or control equipment to be shown in relation to the units of the plant with which they are associated. It is designed to be flexible so that alterations of instrumentation at successive stages of design may be readily shown on a line diagram in such detail as the system permits. Three diagrams are included only to illustrate the application of this system of symbols (2s. 6d.).

* * *

Coal Tar Pitches

The revision of the British Standard for coal tar pitches for building purposes (B.S. 1310 : 1950) now includes in addition to the requirements for the five normal high temperature pitches for building purposes previously covered, two special types of pitch for use in pitch mastic flooring—i.e., low temperature pitch and steam-blown high temperature pitch, the special feature of these pitches being that they can be used at temperatures up to 60° C without emitting obnoxious fumes. The origin and general characteristics of the pitches are laid down and methods of test are included for softening point, specific gravity, matter insoluble in toluole, ash, water content, and distillate. These tests are based upon methods given by the Standardisation of Tar Products Test Committee in 'Standard Methods for Testing Tar and Its Products,' 1950 edition modified where necessary. In addition, the special pitches are required to pass a fumes test. Examples of the use of the various pitches for building purposes are given (3s.).

* * *

Coupling and Shafting Guards

A new British Standard (B.S. 1649:1950) has been published which will be of interest and value to all those who are concerned with preventing accidents due to rotating parts. In this new standard, which takes note of the Factories Act, 1937, and has been prepared with the co-operation of the Engineering Branch of the Factory Department of the Ministry of Labour and National Service, general requirements have been laid down for guards which should be applied to couplings between units such as a motor and a pump, and also guards that are required for a length of shafting and coupling.

Attention is drawn in the foreword to certain features of the regulations dealing with the provision of safety requirements. The specification itself lays down the necessary requirements to ensure that a guard will have sufficient strength and be suitable for its purpose. In addition, one appendix shows different forms of guards and a second appendix gives recommendations for the responsibility of provision of guards. Care has been taken not to define the guards in detail, thus avoiding restriction in design (2s.).

Copies of these new standards may be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1, at the prices indicated, post free.

NEW SHOWROOM AT LARGS

LARGS gas consumers have acquired useful facilities with the opening by the Scottish Gas Board of a well-appointed showroom adjacent to the works in Frazer Street.

The premises include office accommodation for the manager and staff and take the place of the rather primitive and inadequate office inside the works. Designed on modern lines and with furnishings and decorations in excellent taste, the new building has a spacious window and ample accommodation for display.

Sir Andrew Clow, Chairman of the Scottish Gas Board, presided at the opening ceremony which was performed by Provost D. M. Brown. About 40 guests attended, including members and officials of the Town Council and other local public officials. Representatives of the Gas Board included Mr. A. T. Herd, Secretary; Mr. David Fulton, Board Member; Mr. Alex. Jamieson, Group Manager, Greenock, and other group managers from various parts of the West of Scotland.

In proposing the toast of the Scottish Gas Board at a lunch in Curlinghall Hotel after the opening of the new premises, Provost Brown said that when the Town Council heard that the gas works were to be nationalised they were not at all happy about the prospect and they opposed it tooth and nail, but once the deed was accomplished the Council had given the Board every support. The Board, said the Provost, had been very fortunate in taking over an undertaking which, through the foresight and energies of previous councillors, was in first-class condition. The new showroom and office would be an added asset. Although the Town Council had lost the undertaking, the people of Largs were still getting the same good service.

Mr. David Fulton (formerly gas manager at Helensburgh) gave the toast of the guests. He had a word of appreciation for the Largs burgh officials for their assistance and kindness during the 'take over.' Mr. Fulton said that the architect and contractors had to be specially complimented on the expeditiousness of the job, because expeditious work was something that they had almost forgotten.

At an Informal Gathering at the Northampton Gasworks on December 28, Mr. H. F. H. Jones (Chairman of the East Midlands Gas Board) made presentations marking 50 years' service to two former employees. They were Mr. Harry Darby, a former gasfitter who helped to fit the first incandescent gas mantle in Northampton and retired in July, 1949, and Mr. George Dawson, a former works fitter, who retired the following month. These presentations are the first to be made in Northampton.

To Assist in Saving Coal, consumers in Aberdeen are asked to exercise economy in the use of gas, the demand for which in recent weeks has increased considerably, and is now greater than it has ever been. A stoppage in the flow of fresh coal supplies from the pits, due to the New Year holidays, has resulted in a high proportion of coal stocks being used. 'This is seriously affecting the working capacity of the plant, and it may be necessary to reduce pressure sharply,' said Mr. H. S. Milne, Divisional Controller.

Society of Chemical Industry

The 70th annual general meeting of the Society of Chemical Industry will be held at the Imperial College of Science and Technology, from July 9 to 13, under the presidency of Mr. Stanley Robson, M.SC., D.I.C., F.R.I.C. Already 1,300 scientists and their guests, many from the provinces, the Empire and other countries, have expressed their desire to attend. Visitors to the meeting will also be able to visit the Festival Exhibitions during their stay in London.

The organisation of the meeting is in the hands of the Society's Local Section, in this case the London Section under the Chairmanship of Dr. A. C. Monkhouse, of the Fuel Research Station, with Mr. E. L. Streatfield, F.R.I.C., as Hon. Secretary. A full programme of lectures on the principal theme 'Water in Industry' is being arranged.

Economy Urged

An appeal to the public to economise in the use of gas was issued on January 4 by the Edinburgh district of the Scottish Gas Board. Cold weather during December, the Board states, contributed to an unprecedented demand for gas. Output for the month of the Edinburgh district was 729 mill. cu.ft.—an increase of 76 mill. cu.ft., or 10.4%, over the biggest monthly output previously recorded (December, 1949). The highest individual day was recorded on Friday, December 15, when the output was 26.5 mill. cu.ft.

All demands had been met in full, due to the commissioning of additional plant during the past 18 months. The maintenance of production, however, was dependent upon availability of coal, and the level of national stocks of coal must give rise to anxiety about the position during the next few months.

On Tuesday, December 12, the Chairman, Board Members, and chief officials of the North Eastern Gas Board entertained at a Christmas luncheon at the Board headquarters their opposite numbers of the Yorkshire Electricity Board, this being the second goodwill get-together since the two rival industries were nationalised. After the dinner, the guests were shown round the new gas offices, which have only recently been completed.

Gas Helps to Publicise Wales

The Wales Gas Board have been co-operating with the Welsh Tourist Holiday Board in the staging of its exhibition with a view to publicising Wales and attracting visitors to the area during the Festival of Britain. The exhibition, which has been on show in London, is now touring the Provinces after which it will be sent to New York during the spring of 1951 to be shown at Madison Gardens.

While in Wales it has been exhibited, among other places, at the showrooms of the Newport and Colywn Bay undertakings, when in each case it was officially visited by the Mayor and members of the Corporation. Whilst at Swansea, the exhibition was seen by Princess Margaret, who expressed her appreciation.

Wage Increases

An increase of 8s. 6d. in the minimum weekly time rate of women in the engineering industry and of 9s. 5d. in minimum piecework earnings will be paid under an agreement reached between the Engineering and Allied Employers' National Federation and engineering unions representing women workers. As in the agreement recently concluded for male engineers, the new time rate will be a consolidated one, and the increase will be limited to lower-paid workers. The minimum weekly wage for a woman aged 21 will now be 75s. The increases will be retrospective to the first full pay week after November 13.

The Association of Chemical and Allied Employers announce that the Chemical and Allied Industries Joint Industrial Council has agreed on wage advances of 2d. an hour for men and 1½d. an hour for women, to take effect in the first pay week in January. There are also increases of 1d. an hour for men and ½d. an hour for women to take effect in the first pay week in June, 1951. Wage rates of workers under 21 will be increased proportionately.

Although its Protests against the increased gas charges introduced recently by the Northern Gas Board have been rejected, the West Hartlepool Corporation intends carrying on its campaign against the higher rates. The corporation contends that the old Hartlepool gas undertaking was never operated at a loss yet gas prices have been raised an average of 50%.

An Informal Ceremony took place in the demonstration theatre of the Newcastle Division, Northern Gas Board, on December 11, 1950, when, following upon a meeting of the District Education Committee, the Chairman of the Board, Mr. E. Crowther, presented certificates to the successful students in the 1950 examinations in Gas Engineering (Manufacture) and (Supply). The Chairman of the Institution of Gas Engineers Northern District Education Committee, Mr. F. L. Scaife, in a short opening speech introduced the Chairman to the students and outlined the Board's policy towards technical education. After the presentation a vote of thanks on behalf of the students was proposed by Mr. J. A. Gibb (Newcastle Division).

North Thames Gas Sales

The following statistics relating to gas sales (in therms) in the groups represented by divisional committees for the September, 1950, quarter were submitted to the North Thames Gas Consultative Council on December 28:

Berkshire and Buckinghamshire group: Domestic, 2,507,318 (=67.1%); non-domestic, 1,203,275 (=32.2%); public street lighting, 25,337 (=0.8%); total, 3,735,930.

Middlesex and Surrey Group: Domestic, 13,833,568 (=65.9%); non-domestic, 6,818,313 (32.5%); public street lighting, 320,471 (=1.6%); total, 20,972,352.

Metropolitan group: Domestic, 16,280,070 (=53.3%); non-domestic, 13,786,469 (=45.1%); public street lighting, 504,189 (=1.6%); total, 30,570,728.

Essex group: Domestic, 12,204,516 (=72.1%); non-domestic, 4,604,235 (=27.2%); public street lighting, 116,395 (=0.7%); total, 16,925,146.

Total: Domestic, 44,825,472 (=62.1%); non-domestic, 26,412,292 (=36.5%); public street lighting, 966,392 (=1.4%); grand total, 72,204,156.

THE usual weekly cookery demonstrations held at the main showrooms of the Eastern Gas Board (Cambridge District) continue their popular appeal, but interest increases considerably when Christmas cookery is featured. So great has become the demand for admission that this year it was necessary to devise a scheme which would ensure that all who wished to attend could be accommodated. Press notices were published inviting applications for tickets, and although similar demonstrations were held on three consecutive days, the seating capacity was taxed to the limit.

Such a gratifying response was a tribute to the Cambridge District Home Service Adviser, Shirley Snow, and her assistant, Dorothy Coe. Clear and detailed instructions in the art of icing and decorating the Christmas cake were followed with close attention, and at the conclusion of the series many expressions of appreciation were forthcoming. The final demonstration of the session was devoted to a miscellaneous programme, when those who were seeking original ideas for the Christmas party found a host of suggestions awaiting them. Our photograph shows the Home Service Advisers with some of their handiwork.

Trade News

In this section we publish news from the appliance manufacturing side together with notes on new gas plant, processes, and installations which will keep the industry abreast of current developments in production, distribution, and utilisation.

C. & W. Walker, Ltd.

C. & W. Walker, Ltd., gave a dinner for long service employees and their ladies on December 15, in the canteen (photograph, bottom left). Over 250 people were present and barometers were presented to four employees, each of whom had completed 50 years' service. Among the visitors were Mr. C. H. Woodfine and Mr. S. H. Johns, of the Wellington Gas Undertaking, and representatives of British Road Services and British Railways. There were also present a number of old employees who had retired after 50 years' service or more. One of the most noteworthy was Mr. George Harris, in his ninetieth year, who had completed 70 years' service with the firm. The Chairman and Managing Director, Mr. S. M. Milbourne, was supported by Mr. C. L. Lee (Director), Mr. G. F. H. Beard (General Manager) and other members of the management and executive staff. After the presentation of the barometers, a bouquet was presented to Mrs. S. M. Milbourne and a buttonhole to Mr. S. M. Milbourne. The dinner was followed by an entertainment and community singing.

The W. E. Bray & Co., Ltd., 'Hydra-loader.' Bucket capacity, 1 cu.yd.; overall height (bucket raised), 14 ft. 9 in.; overall height (bucket on ground), 6 ft. 11 in.; max. discharge height, 10 ft. 3 in.; one full width bucket, 6ft. 6 in.; overall length, 15 ft.; overall width, 7 ft.; operating weight, approx., 4 tons 7 cwt.

J. Mollett, Ltd., Darley Street, Bradford, were the winners of the £50 first prize in the Hurseal Heat Window Display Competition organised by Hurseal, Ltd., 229, Regent Street, London. Their ingenious use of the model thermometer provided definite sales appeal.

George Wilson Gas Meters, Ltd.

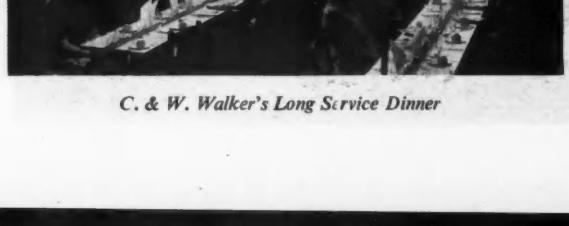
On December 15 the Coventry Works held their annual dinner at a local hotel, which was attended by all the Directors. After a brief review of the work of the Social Club by its Chairman, Mr. Ivor Davies, and expressions of congratulation from the President, Mr. W. D. Wilson, the evening was devoted to dancing and entertainment by local artists. The photograph (bottom right) shows the Committee with the President, including Messrs. L. Wildsmith, I. G. Davies (Chairman); R. Jones (Treasurer); R. Randle (Secretary); A. Moore; S. Smith; W. D. Wilson (President); J. Smith. On the same evening the Manchester Works also held their annual dinner under the Chairmanship of Mr. R. B. Reynolds.

Richard Klinger, Ltd.

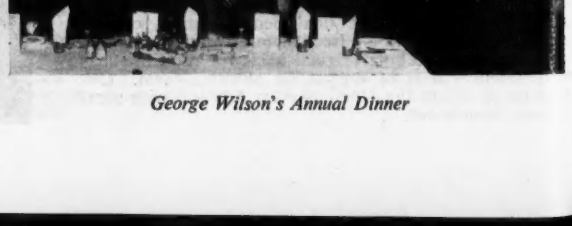
Richard Klinger, Ltd., are now marketing the Klinger AB10 Cock which is to replace the small taper plug cocks for pressure gauges, air reliefs, drains, instrument connections, compressed air, gas or hydraulic controls and similar equipment. Machined from a hot brass stamping and polished all over, this is a simplified design with a minimum of components, based on the well known Klinger 'sleeve - packed' principle. Tested hydraulically to 1,000 lb. per sq. in. it will give reliable service and easy maintenance with long life under the most exacting conditions. Offered at prices comparable with ordinary unpacked fittings, it is available in six different patterns, with a bore of $\frac{5}{32}$ in. having $\frac{1}{4}$ in. or $\frac{3}{8}$ in. B.S.P. male and $\frac{3}{8}$ in. or $\frac{7}{16}$ in. Whit. Hex. female screwed connections, provided with or without union ends.

The Quasi-Arc Co., Ltd.

The Quasi-Arc Company have added a 300 amp. foot-operated isolating switch to their range of welding plant and ancillary equipment. This switch is designed for use in conjunction with a standard Quasi-Arc welding transformer and enables the operator to make his holder

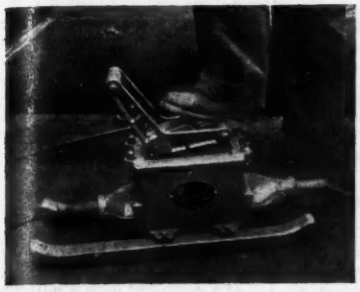


C. & W. Walker's Long Service Dinner



George Wilson's Annual Dinner

'dead' when he is not welding. This foot switch is proving particularly valuable when welding in confined spaces. The operating parts of the switch are contained in an aluminium case, and the equipment is mounted on skids. The mechanism comprises two 150 amp. switchblades in parallel and operated by



The Quasi-Arc foot-operated isolating switch for use in conjunction with standard welding transformer.

quick-break mechanism of substantial construction. The isolating switch is connected in the lead from the arc welding plant to the electrode holder, and push-in type plugs and sockets made to the dimensions and tolerances of B.S.1071 are fitted at each end of the switch box.

Power-Samas Helps Population Census

Hard on the news that H.M. Government has chosen Powers-Samas equipment to help in the work of the 1951 census of population comes advice that the Swedish census of population (which likewise takes place in 1951) is also to be done with the aid of Powers-Samas equipment, the Swedish Authorities having just signed a contract with L. M. Ericssons, Driftkontroll, A.B. (the Powers-Samas representatives in Sweden), for 65-column universal automatic key punches, sorters, and universal printing counting sorters.

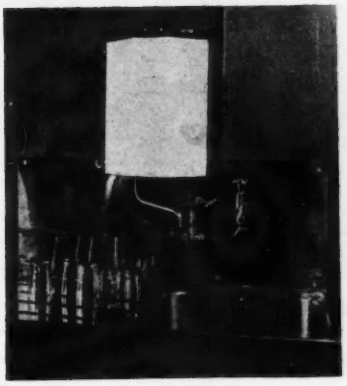
Gas Appliance Firms in the Falkirk area are trying to work out a solution to the power cut problem. The Forth Valley Industrial Development Association has accused the electricity board of the wrong approach to the problem when they belaboured industry for using too much electricity. A 30% cut in consumption has been sought, and employers and workers are to get together to seek a solution. A proposal for a one-day closing has not been favoured since the electricity authorities indicate that they cannot guarantee that power will not be exported to other areas on that idle day.

The Radiant Heating Ltd. stand at the Fuel Efficiency Exhibition held recently in Manchester.

Falk, Stadelmann & Co., Ltd., manufacturers of lighting, heating and cooking equipment, of London, have appointed their assistant branch manager, Mr. James Stewart, as manager of their branch at 254, Clyde Street, Glasgow, C.1, in succession to the late Mr. C. J. B. Gregg (see our Obituary column this week).

LIVE and LET LIVE

'LIVE and Let Live' is not usually found engraved on the walls of a home. Yet these actual words appear at the entrance to Homes founded by the Beer & Wine Trade for men and women over 55. These houses, consisting of separate flats for each tenant, are real homes. To qualify to live in one, the people must have been members of the licensing trade and have held a licence to run a public house, beer house or off-licence. They must also have been members of the Beer & Wine Society Benevolent Fund. What are the amenities of these houses? Undoubtedly, the Society realised that they would be occupied by people who, for most of their adult life, have worked very hard and can remember the drudgery and inconvenience of inadequate hot water for domestic work, and out of date methods of heating. Therefore, gas was selected as the most modern and economical fuel for water heating and cooking, with gas-ignition for solid fuel fires.



Gas Installation in Licensing Trades' Home for Old People

Each flat has a bedroom, sitting room, and a kitchenette. A New World 'Newlyn' S12/2 water heater gives abundant hot water and a cheerful fire can be obtained in a few minutes in sitting room or bedroom by the use of the gas poker. Bathrooms are adjacent to the flat of the official superintendent (an employee of the Society) and hot water is supplied from a gas-heated automatic boiler. The tenants who occupy the flats live there rent-free, light, fuel and water heating being provided without charge. They pay for the gas used for cooking, together with any additional gas used for fires, etc.

A large board room can be used for social activities and conveniently near is a service room, which has a 'Newlyn' Water Heater, used for washing glasses and cutlery. These flats are pleasant places in which to make a home, as the residents, some of whom have been in occupation for as long as 28 years, will agree.

Sulphate of Ammonia Propaganda

New World Records in Production and Consumption

THE 30th annual report of the British Sulphate of Ammonia Federation, covering the year ended June 30, 1950—the 53rd year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, the Federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd.—states that in 1949-50 new world records were achieved in both production and consumption of fertiliser nitrogen.

World consumption estimated at about 3.79 mill. metric tons was 12% greater than in the previous year, and the percentage increase in production was of the same order. As in the previous year, however, production exceeded consumption and the cumulative stock carried forward on June 30, 1950, represented about 12% of the 1949-50 consumption or six weeks' fertiliser nitrogen production. For the first time for many years producers and distributors are reported to have an adequate working stock.

The total United Kingdom production of nitrogen products in the calendar year 1949 was 2.5% higher than in 1948. Output of fertiliser products increased by 3% and of industrial products by 1%.

Table I, which expresses world production and consumption of fixed nitrogen in thousands of metric tons of pure nitrogen for 'Fertiliser years' ended June 30, is compiled from published information available regarding production and consumption of nitrogen in all countries.

The figures in Table II are based on deliveries against sales within each fertiliser year and show an increase of over 40,000 metric tons of nitrogen for the year under review. Exceptionally large deliveries were made to farmers during May and June. This demand was partly due to weather conditions, but was also influenced by the knowledge that a substantial increase in price would take place on July 1, 1950, owing to the removal of about half the subsidy on fertilisers. It is estimated that about 20,000 tons of nitrogen may have been carried forward to the coming year. On this basis the increase in home consumption of fertiliser nitrogen in 1949-50 was about 11%.

The substantial increase in consumption is undoubtedly due, says the report, to the fact that more and more farmers are beginning to appreciate that adequate use of suitable fertilisers at the right time is essential for the improvement of yield and quality of crops. Weather throughout the year was generally favourable for the use of fertilisers, and the record demand for compound fertilisers containing sulphate of ammonia as the nitrogen ingredient shows that farmers recognise the importance of a proper balance of plant nutrients. Despite this increase in the use of compounds the demand for sulphate of ammonia for direct application was only slightly less than for the previous year. Removal of the remainder of the subsidies on feeding stuffs gave an impetus to increased use of nitrogen on grassland and also to the development of methods of grass conservation.

Silage making is expanding satisfactorily and is gradually becoming established as a standard method of fodder

TABLE II

Production of Nitrogen Products and Sulphate of Ammonia in United Kingdom
(Long Tons of 2,240 lb.)

The quantities in the first tonnage column show the total production of nitrogen products expressed in terms of a standard material containing 25% ammonia = 20.6% nitrogen. The last column shows tons of sulphate of ammonia actual'y produced with a nitrogen content varying from 20.4 to 21.1% N.

Calendar Year							Included in the Total Industrial Ammonia Products	Sulphate of Ammonia as such
1939	...	...	...	...	...	...	856,800	263,900	483,300
1947	...	...	...	...	...	...	1,408,600	291,200	796,700
1948	...	...	...	...	...	...	1,648,800	355,100	901,000
1949	...	...	...	...	...	...	1,691,100	358,800	924,500

Home Agricultural Consumption in United Kingdom.

Fertilizer Year				Nitrogen (Metric tons of 2,204.6 lb.)		
			Sulphate of Ammonia, Long tons of 2,240 lb.	Sulphate of Ammonia	Nitrogen in other forms	Total Nitrogen
1923-24	...	...	128,000	26,800	7,600	34,400
1930-31	...	...	142,400	29,800	10,400	40,200
1938-39	...	...	179,800	37,600	23,000	60,600
1943-44	...	...	664,041	138,981	42,771	181,752
1944-45	...	...	612,381	128,169	44,305	172,474
1945-46	...	...	552,202	115,574	48,889	164,463
1946-47	...	...	551,208	115,366	48,700	164,066
1947-48	...	...	632,916	132,467	52,943	185,410
1948-49	...	...	593,779	124,276	60,828	185,104
1949-50	...	...	748,115	156,577	69,083	225,660

TABLE I

World Production and Consumption of Fixed Nitrogen for all Purposes
(In Thousands of Metric Tons).

	1949-50		1948-49		1947-48	
	Production	Consumption	Production	Consumption	Production	Consumption
Europe (*a*)	2425.6	2210.3	2067.4	1954.3	1701.7	1757.6
Belgium-Luxemburg	182.9	84.9	172.7	76.3	155.6	89.1
France	234.3	250.3	195.0	250.9	176.4	244.9
Germany — Western Zones	496.9	368.4	377.2	377.5	244.2	294.4
Netherlands ...	113.6	146.2	86.8	117.6	78.1	118.0
Norway	153.0	42.1	112.0	30.8	88.4	24.0
Italy	137.0	138.6	120.2	125.4	116.0	115.8
United Kingdom ...	361.8	276.4	356.0	248.9	321.6	245.4
Other Europe (*a*) ...	746.1	903.4	647.5	726.9	521.4	626.0
Asia (*b*)	470.5	738.9	372.1	636.8	287.7	554.2
China and Formosa...	10.4	58.9	4.7	42.2	8.2	48.9
India and Pakistan ...	11.3	73.6	9.6	51.8	8.6	41.8
Ceylon	—	12.2	—	10.7	—	10.2
Japan proper ...	386.4	442.5	301.2	378.6	221.4	325.1
Other Asia (*b*) ...	62.4	151.7	56.6	153.5	49.5	128.2
Africa	18.6	149.2	17.4	123.4	17.3	109.5
Egypt	0.2	96.3	0.2	75.7	0.2	66.4
Other Africa ...	18.4	52.9	17.2	47.7	17.1	43.1
Oceania...	11.9	22.8	12.6	18.4	9.1	16.8
America	1791.5	1296.0	1686.8	1248.1	1595.0	1175.6
U.S.A. (*c*)	1328.0	1176.1	1214.0	1141.5	1129.9	1064.5
Canada	190.0	43.4	189.8	39.1	182.9	37.6
Chile	270.9	14.0	280.8	12.2	280.0	10.7
British West Indies...	—	7.3	—	8.3	—	5.7
Other American ...	2.6	55.2	2.2	47.0	2.2	57.1
World total	4718.1	4417.2	4156.3	3981.0	3610.8	3613.7

(*a*) Including Eastern Zone of Germany and U.S.S.R. (*b*) Including North Korea and Manchuria. (*c*) Including Hawaii and Puerto Rico.

conservation by an increasing number of farmers. Additional grass dyers operated on a co-operative or contractural basis came into production during the year. Both members received considerable stimulus as a result of the final removal of subsidies on feeding stuffs, and farmers are becoming more receptive of advice to improve grassland management and technique with the object of reducing the cost of feeding stock. Improvements along these lines must result in an increased demand for nitrogen.

United Kingdom exports of sulphate of ammonia in 1949-50 were 15% greater than in 1948-49. Prices charged to British farmers for sulphate of ammonia delivered in 6 ton lots to buyers' nearest station (for neutral quality guaranteed to contain not less than 20.6% N.) in 1949-50 were £9 16s. in the summer and £10 12s. in the spring. Since 1934-35 summer prices have been increased by 1s. 6d. per ton per month up to the spring price. From 1940-41 to 1949-50 prices to farmers were 'pegged' and producers received a subsidy on home agricultural sales to cover increases in cost not included in the price. To cover increased railway freight rates prices were advanced by 1s. per ton from July, 1946, by a further 5s. per ton from October, 1947, and by another 4s. per ton from May 15, 1950.

Membership of the Federation stood at 73 on June 30, 1950, compared with 79 a year earlier. One member had resigned on ceasing production, and membership was further reduced by five due to amalgamation within the industry.

Sports Club Success

The Wellingborough Gas Undertaking sports club held a dinner recently, at which Councillor E. H. Hearnden, works manager, proposed the toast to the visitors. He said that in addition to a very strong undertaking at Wellingborough, the sports side was building up and had an excellent reputation in the town.

Mr. D. A. Foster, group manager, said: 'I think the Wellingborough undertaking is one of the most efficient, and I am sure that the reason for your success is the good feeling which exists between the workers and the management.' Mr. Foster presented cups to Mr. A. C. Boddington (bowls champion), Mr. A. Clark (winner of the darts trophy), and Mr. A. Randall (table tennis trophy).

Demand for Gas Appliances continues very high in Scotland. In most instances undertakings are not actively pushing equipment although they are accepting business to the capacity of the load. It is appreciated that refusal to sell new appliances now might mean the loss of subsequent consumption, for the sake of economy over the next two difficult months. A limited amount of development is being adopted, therefore, despite the problem involved.

Change of Address.—The laboratories of the National Benzole Co., Ltd., and of the National Benzole Association will be transferred on January 15 to Otterspool Way, Watford By-pass, Watford, Herts. (Telephone: Gadebrook 2786/7.)

CONSULTATIVE COUNCILS IN SESSION

All Demands Met by 1955

THE Deputy-Chairman of the North Eastern Gas Board (Mr. G. E. Currier) said in Leeds on December 18 that by 1954 or 1955 the Board would be able to meet any demand made upon it by consumers. The only thing that might upset supplies would be a very abnormal demand in a particular district due to rearmament.

Mr. Currier was reviewing the progress made by the Board at a meeting of the North Eastern Consultative Council. He said that since vesting day the Board's plans had been designed to meet an urgent need for the replacement of manufacturing plant which had become obsolete and inefficient; the provisions of additional plans to meet increasing gas demands and the reinforcement of distribution systems.

In order to meet increased demands on the West Yorkshire grid, which supplied the whole requirements of 11 districts and the partial requirements of six districts, major plant construction had been put in hand at Glass Houghton and Tingley. The first section of the new Tingley works when completed in 1952 would be capable of producing 7 mill. cu.ft. of gas per day and 250 tons of coke. The works would incorporate a number of unusual features including a new system of handling wagons which would be the first of its kind in the country.

It would be completely automatic, speeding up the handling of traffic and at the same time reducing operating costs. All the major plant for the first section had been ordered and also much additional plant required for the second installation. It was to meet conditions beyond 1955 that a second plant would be built at Tingley to produce a further 7 mill cu.ft. per day. Work should be completed in 1954.

Mr. Currier said that the manufacturing station in Bradford was to have received from the grid a maximum quantity of 21.4 mill. cu.ft. per day, but this had not been available for two or three years. In consequence a new carburetted water gas plant of 2.5 mill. cu.ft. capacity was now in production there. In addition, provision had been made for a new coal carbonising plant of 6 mill. cu. ft. capacity, and when this was completed in 1952 there would be a full manufacturing capacity of 20 mill. cu.ft. per day.

Mr. Currier said this output would satisfy local requirements for at least the next ten years, and also enable supplies to be provided for Shipley, Bingley, and Keighley.

Alderman J. H. Whitaker (Todmorden) said that unless the proposed economies in production more than offset the cost of additional expenditure on the grid, consumers would not derive any benefit.

Mr. Currier said he wanted to make it quite clear that the Board had not the slightest intention of establishing a gas grid in Yorkshire similar to the widespread electricity grid.

In answer to a further question Mr. Currier said that Leeds and Bradford were the worst off for coke supplies. In order to meet that position coke was being transported from Shipley, Halifax, and Huddersfield, which had surplus supplies. He said that consumers' supplies might have to be cut to 95% of their deliveries last winter.

Dr. R. S. Edwards (Chairman of the Board) announced that because of the economic situation it had been decided to turn down a consultative council's request for an extension of the hire purchase period.

Here is another attractive seasonable window display—in the showroom of the Pembroke undertaking. Design and construction of the display, which was cut out of laminated board, was by their own staff, while the painting was done by a local artist.

RECOVERY OF PURE SULPHUR FROM COAL GAS*

By

E. JOHNSON, B.Sc., Ph.D., F.R.I.C.

Institution Gas Research Fellow

ONE aim of the present investigation was the development of a fluidisation process for extraction of pure sulphur from spent oxide that could be operated in conjunction with the previously developed fluidised purification process. Ideally, the process would be required to fulfil three main technical requirements—namely, (*a*) it must operate continuously and at the same rate as the purification process, (*b*) it must yield a sulphur of high purity, and (*c*) the oxide after extraction should not have lost reactivity to hydrogen sulphide. Provided that the extraction process satisfied the above conditions, its further development would then be governed largely by the economic acceptability of both it and the complementary purification process. An outline of the economic position of the processes in relation to existing practice has been attempted and is discussed below.

A consideration of two aspects of the situation would seem desirable—*viz.*,

(1) that from the point of view of the nation, as a whole, and

(2) that from the point of view of the gas industry only,

both of which are discussed separately.

Table 1 contains some relevant statistics for the year 1946, the last year for which full data could be obtained.

Coal carbonised	42,500,000 tons.
Gas made	400,000,000,000 cu. ft.
Sulphur imports	250,000 tons.
Spent oxide used for H_2SO_4 manufacture	174,000 tons.

Assuming that on an average the foul gas contained 600 gr. per 100 cu.ft. of hydrogen sulphide, all of which was converted to sulphur, using iron oxide, then a total weight of 150,000 tons of sulphur would have been obtained. Some of this sulphur was utilised, since 174,000 tons of spent oxide was burnt for sulphuric acid manufacture, and, if the average sulphur content of the spent oxide was 45%, then 80,000 tons of the available sulphur were used, which means that 70,000 tons of sulphur were wasted.

Obviously, if this sulphur had been extracted and used the total imports of sulphur could have been reduced by an equivalent amount to 180,000 tons, a saving of 28%, or £560,000 in dollars at the prevailing prices.

In this connection, it might be noted that the total quantity of coal consumed in 1946 was approximately four times the amount carbonised, which means, assuming the same average sulphur content, that had the necessary plant been installed to remove sulphur dioxide from flue gases, approximately 600,000 tons of sulphur could have been obtained; this quantity is approximately twice the sulphur consumed in that year.

At the present time the selling price of a spent oxide containing 45% sulphur is 6d. per unit, a unit being 1/100 of a ton, whereas crude sulphur costs £20 5s. per two ton load. Hence, a ton of crude sulphur costs £10 2s. 6d., while a ton of sulphur in spent oxide sells at £2 10s.

If a process were developed for producing a sulphur of high purity from spent oxide, and the price were to be competitive with that of crude sulphur, then the operating cost should be less than £7 12s. 6d. per ton. This figure ignores the possibiity of re-using the extracted oxide, but it was found in Germany that if cyanides were removed the oxide could be used four times. Again, assuming a 45% sulphur content in the spent oxides, then four tons of sulphur can be removed by 1.2 ton of oxide, a saving of 3.6 tons. At a cost of £3 5s. 7d. per ton, this amounts to a saving of approximately £15 15s. for four tons of sulphur, or £3 19s. per ton of sulphur. Thus, under ideal condition the operating margin should be of the order of £11 10s. per ton of sulphur.

At this stage of the investigation of the application of the fluidised solids technique to the extraction of sulphur from spent oxide, the following conclusions may be drawn:—

(1) A semi-continuous process for the extraction of sulphur from spent oxide in a fluidised bed by means of solvents is possible and no fundamental difficulties should be encountered in making the process fully continuous.

(2) The use of a fluidised bed of solid gives an increased rate of solution compared with a static bed.

(3) A product containing 95% sulphur is capable of being obtained.

(4) The best method of obtaining the sulphur product from solution is by cooling, rather than evaporating a hot extract.

(5) Digestion of the spent oxide with hot solvent does not significantly affect the reactivity to hydrogen sulphide of the extracted oxide, so that an integrated purification and extraction process, ignoring the effect of cyanides, should be virtually self-sufficient in oxide.

(6) Since such a process would normally be situated at a gasworks, the best solvent to use would be benzole, a mixture of benzene, toluene, and xylene.

(7) At the present time (1950) the price difference between the sulphur in spent oxide and crude sulphur should be sufficient to make an extraction process an economic possibility.

A Possible Large-scale Extraction Unit

Williamson and Garside tentatively designed a unit for the purification of foul coal gas by means of the fluidised solids technique. The plant was intended to treat 1 mill. cu.ft. of foul gas per day and produce spent oxide with a sulphur content of 40% at the rate of 88.5 lb. per hr. A further unit has now been tentatively designed to accommodate the latter quantity of material, and to extract from it the available sul-

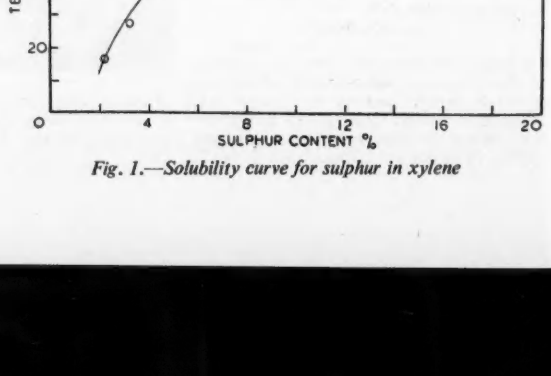


Fig. 1.—Solubility curve for sulphur in xylene

* From Communication No. 378 (a) of the Institution of Gas Engineers.

phur in a fluidised bed by means of a solvent. The design should not be regarded as final, and is merely intended as a possible design for a pilot plant.

Since the spent oxide contains 40% sulphur, then 35.5 lb. of sulphur per hr. have to be extracted if the rates of the purification and extraction units are to be the same.

While the most likely solvent to be used for the process will be a mixture of benzene, toluene, and xylene, the solubility curve for sulphur in xylene, shown in Fig. 1, will give approximate values for the concentration of sulphur in the benzole in the crystalliser and the extractor. Thus, assuming the crystalliser temperature and the temperature of extraction to be 30° and 80°C. respectively, the equilibrium concentration of sulphur in the crystalliser will be 3.3 g. per 100 g. of solvent, whilst in the extractor the concentration will be 11.6 g. per 100 g. of solvent. Hence, 8.3 lb. of sulphur will be extracted by 100 lb. of solvent—*i.e.*, 35.5 lb. of sulphur per hr. will require 427 lb. per hr. of solvent. Assuming the 'efficiency of extraction' to be 50%—*i.e.*, the solvent removes only 50% of the sulphur theoretically possible—the mass rate of flow of solvent required is 854 lb. per hr., or 15.8 cu.ft. per hr.

Since the linear velocity required to fluidise spent oxide of sieve size 52 to 150 B.S.S. with benzole is 0.136 in. per sec., the tube diameter required to produce this linear velocity from a volume rate of 15.8 cu.ft. per hr. (7.6 cu.in. per sec.) is 8.5 in. An 8 in. dia. tube will produce a linear velocity of 0.15 in. per sec. Consequently, the diameter of the extractor would be 8 in., since the solid bed will then be above the point of initial fluidisation and so will not be so sensitive to reductions in the flow-rate. The extractor proper would be a tube, 8 in. dia. and about 6 ft. long, surmounted by an expansion head, 1 ft. 6 in. dia., and 1 ft. long, which would cause particles less than 0.00364 cm. in size to settle out. The tube would have a conical base into which the hot solvent would be fed, as shown diagrammatically in Fig. 2.

From the top of the extractor the solution would pass to the crystalliser to precipitate the sulphur, the cooling being effected by means of water. Periodically, the crystals could be withdrawn and centrifuged to remove a great deal of mother liquor which would be returned to the system. The complete drying of the sulphur would have to be by tray drying.

To prevent a blockage in the system caused by further cooling of the solvent after it has left the crystalliser, the mother liquor would be immediately heated by means of a steam jacket around the main transfer line.

The storage tank should be capable of holding the total amount of solvent in the system and should be maintained at a temperature above the cooler temperature, even though the plant were not in operation, to prevent precipitation of sulphur there.

Circulation of solvent would be by means of a solvent-tight centrifugal pump capable of pumping at the rate of 100 to 150 gall. per hr. against a head of approximately 10 ft. of water.

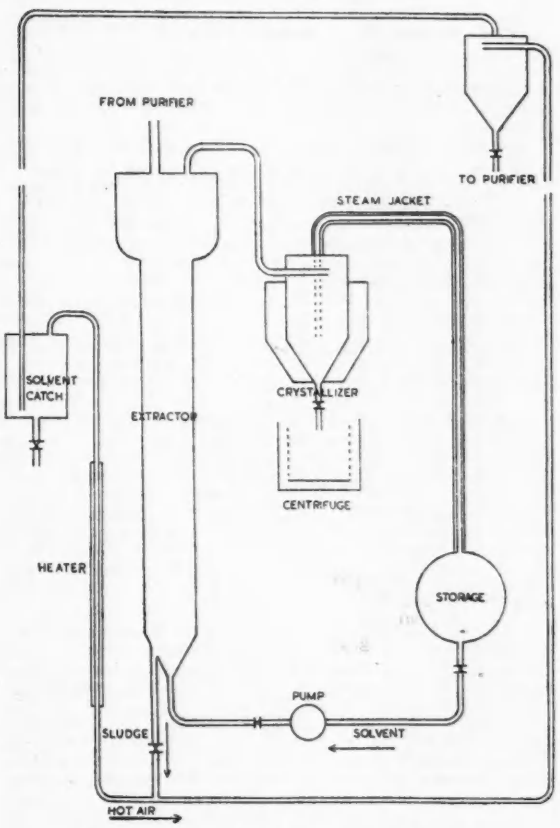
While the flow of oxide was never continuous on the laboratory scale, it is suggested that continuous flow might be obtained by the following method:—

The spent oxide from the fluidised purification unit at the rate of 88.5 lb. per hr. would be fed by gravity into the extractor and would flow as a sludge down the stand-pipe to be carried away in the air stream. The sludge would contain by volume approximately 70% solvent and 30% extracted oxide (56% oxide and 44% solvent by weight) and would flow due to the hydrostatic head above, behaving as a 'liquid' of increased viscosity.

The hot air stream would serve two purposes; firstly, it would carry the extracted oxide back to the purification stage, and secondly, during the time the solid was airborne it would evaporate the xylene. After depositing the extracted oxide in a cyclone precipitator the air would be cooled to condense the xylene vapour, which would be separated in the solvent catch and returned to the storage vessel. From there the air would pass through a heater to be re-cycled for drying the oxide.

The impurities likely to be obtained in the sulphur product are tar and iron oxide, the former being extracted from the spent oxide at the same time as the sulphur, and the latter being entrained in the solvent stream. In the laboratory the spent oxide used was virtually free from tar so that the only impurity in the sulphur product was iron oxide, which amounted to 5% by weight.

At the present time much tar is deposited from the crude coal gas stream in the purifier boxes, due to inefficient tar removal. This tar deposition would have to and could be prevented in the proposed integrated purification and extraction processes, since (*a*) while it is thought that the purification process will tolerate a small amount of tar, any appreciable quantity will cause agglomeration of the oxide, with a consequent loss of fluidity, and (*b*) it will be extracted with the sulphur giving rise to an inferior product. The tar in the crude gas stream can be removed efficiently by the use of electrostatic 'de-tarrers.'



ig. F2.—Proposed large scale extraction process

A small amount of tar in the solution from the extraction process might well be dealt with by passing it through active carbon, since it was found in the laboratory that a solution of sulphur in xylene darkened with tar was made appreciably lighter in colour by the addition of active carbon.

Since most of the sulphur would be used for burning to sulphur dioxide for the manufacture of sulphuric acid, the impurity of 5% iron oxide might well be no disadvantage. However, if it were considered harmful it could be prevented from adulterating the sulphur product by filtering the hot extract before it passed to the crystalliser. While filtration would have to be carried out at an elevated temperature, due

to the fact that the solvent is not completely saturated, a small amount of cooling could be tolerated.

It was found in Germany that if sulphur alone were extracted from the spent oxide the rejuvenated oxide could be used a further twice only before it became inactive to hydrogen sulphide. If, however, ammonium salts and cyanides were extracted also, the former by means of a water wash and the latter by mixing with slaked lime and leaching with hot water, the oxide could be used four times before becoming inactive. Since the aim of the present investigation is to obtain a process virtually self-sufficient in oxide, then either (*a*) the cyanides could be removed as calcium salts in accordance with German practice, in which case the oxide could be used for four cycles before being discarded, or, alternatively, (*b*) the formation of ferro-ferri-cyanide and other compounds that render the oxide inactive to hydrogen sulphide could be prevented by the use of an alternative oxide that, while still reacting with hydrogen sulphide, would not react with hydrocyanic acid. A possible oxide of this type is manganous oxide, which reacts with hydrogen sulphide to form MnS and is capable of re-oxidation to MnO.

DISCUSSION

Mr. **C. Cooper** (W. C. Holmes & Co., Ltd.) said he had been very much interested in the report presented by Dr. Johnson, and assuming that, in the end, the full cyclic process for purification and extraction came into the field, then he would say that this would be a valuable contribution to the art of purifying gas.

A topical matter to which he would refer was an article which had appeared in the *Financial Times* of November 20. The author of the article was concerned with the impending famine in sulphur—which was, indeed, the headline of the article. The writer had certainly hit a number of nails on the head, but he had also hit one that was not to be hit, when saying that the gas industry could produce a lot more sulphur if it pushed its purification up to 100%. That particular nail had indeed been already driven well up to the head rather than missed.

These statements were perfectly correct so far as was known today, and they became relevant to the present discussion if one considered why they had not had extraction processes on a working scale. There were firms extracting sulphur from spent oxide in this country now, but not on the scale of an area board. The differential price between what could be obtained for spent oxide even in the worst times and the price for a marketable sulphur had apparently not been good enough. When the famine arrived, perhaps it would be good enough—he did not know—but it must be remembered that in between the two it was necessary to provide a good deal of money for labour and various services. So it was not to be considered at all a certain thing that extraction processes, even with the favourable figures quoted by Dr. Johnson, could be expanded at will.

Dr. **J. G. King** (Director, Gas Research Board) said that it was apparent, even from the abridged report which had been presented, that Dr. Johnson had covered a good deal of ground in his year's research work. It had been apparent that the full explanation of the mechanics of flow had not been available—as, for example, why there was a divergence from Stokes' Law in the rate of settling of free particles. This new evidence would therefore be welcome. It was a coincidence that a theoretical paper had just emerged from the Carnegie Research Institute deriving a similar equation (Contribution No. 157, Roy and Howard). He would recommend this for Dr. Johnson's attention.

The mechanics of solid/liquid systems had not received as much attention as solid/gas systems. There was no fundamental reason, however, why the physical conditions in a solid/liquid system should be different, provided that there was an adequate difference between the densities of the two phases to allow of a sufficient rate of flow of the liquid phase. Dr. Johnson seemed to have demonstrated this possibility in the case of the extraction of iron oxide with benzene, etc., mixtures.

In the absence of his experimental data, it was perhaps unfair to discuss the given conclusions which he had expressed, but perhaps some comment might be permissible.

It was misleading to suggest that the gas industry only was concerned with the 42.5 mill. tons of coal carbonised annually. The gas industry today recovered practically all the sulphur from the gas which it made (not all the sulphur in the coal, of course), and no introduction of a new recovery technique would increase this. A new process of gasification would perhaps make available a much higher proportion of sulphur originally present in the coal.

The possibility of increase rested only in the introduction of purification plant in the coke oven industry, and this could not be justified economically as a charge on coke manufacture. Further, it seemed a pity to complicate a research paper by discussing economics at so early a stage, and particularly in the absence of reliable data. The price differential between pure sulphur and spent oxide sulphur was, for example, much too high, and affected the further calculation based on the repeated use of oxide.

The rate of flow of solvent through the fluid bed was controlled to within the definite range of velocity over which fluidisation was possible, and there was no theoretical reason why the solution leaving the bed should be fully saturated at this rate of flow. Since crystallisation included cooling and re-cycling of the solvent, it was inevitable that the process envisaged would be thermally inefficient, unless, providentially, the rates required by fluidisation gave a saturated solution. This seemed to be very unlikely, but in the absence of evidence one could not be sure. Further, although finality could be reached in the fluid phase, it could not be reached in the solid phase in a continuous system unless a number of stages were used.

It would seem that Dr. Johnson had not studied Dr. Moignard's paper of 1949 (GRB 52), since it was shown clearly in this paper that modification of the gas purification train before the oxide box could provide a spent oxide from which sulphur of a purity of over 99.5% could be obtained. It was important to postulate this, since sulphur of 95% purity was not at all acceptable to the sulphuric acid industry. Moreover, Dr. Moignard had shown that the extracted oxide which had been protected in this way from contamination would have a higher activity than the original oxide. A further point which had escaped consideration was that spent oxide was normally a heterogeneous mass containing particles of a wide divergence of size and that full control over a fluidised process would probably be obtainable only with an artificial and closely-graded oxide.

Finally, in the author's description of a large-scale extraction process, he proposed to use hot air for the movement of solvent round a system. Dr. King felt that such a proposal would not be commendable from the point of view of working risk. Considerable precautions would have to be taken to recover solvent from the sulphur, or sulphur losses would discount the value of the process.

Mr. **V. T. Taylor** felt that it was a little difficult to comment when only the abridged proof of the report was available, but he wished to ask two questions which, he thought, had an important bearing on the use of fluidised beds for any chemical process.

First, what range of size could be accommodated in a fluidised bed? Dr. Johnson had suggested that fluidisation could occur over a range of particle size from 0.3 cm. down to 0.004 cm.—a range of size of about 80 to 1. It appeared more likely that there was a very strict limit to the range of size of particles which could be accommodated in the same fluidised bed, and that any process where an accretion of the particles took place would necessitate a model stage reactor or loss of the finer particles.

The second question, which a full text of the report might answer, was how instantaneous was the mixing in a fluidised bed? Could the mixing be controlled and could the withdrawal be delayed? If no control could be obtained over those conditions, the material withdrawn would always contain a mixture of particles that had resided at the bottom for a long time and those which had been in for a very short time, and this would be detrimental to many of the processes envisaged.

Dr. **Johnson**, in a brief reply to the discussion, said that in a fluidised system the material was completely homogeneous. The chemical analysis of the material at the top of the bed, the bottom of the bed, at the sides and in the middle of the bed, should give the same result. That was one of the snags—if it could be called a snag. There was complete mixing, so that if one wanted to work a stage process it would be

(*Concluded on p. 125*)

TOWN GAS FROM PETROLEUM OIL*

By

H. STANIER, M.A. F.R.I.C. (Chief Chemist),

and

J. B. McKEAN, B.Sc., M.Inst.Gas E., A.R.I.C., A.M.I.Chem.E. (Chemical Engineer),

South Eastern Gas Board.

THE most widely used process for the gasification of oil is that which has been operated in the gas industry for many years for the enrichment of blue water gas—*i.e.*, the carburetted water gas process. This employs a light mineral oil as an enriching medium and has proved a valuable adjunct to coal gas plant at times of peak load.

A cyclic process developed in the U.S.A. for the gasification of heavier fuel oils, which has found a limited use in this country, is that of L. B. Jones. Here the oil is cracked in a generator at very high temperature, the heat absorbed in the cracking being restored by combustion of the residual carbon.

More recently, a cyclic process operating at somewhat lower temperatures has been developed in the U.S.A. by E. Hall.

Other processes, notably that of the former Gas Light and Coke Company and the French 'G.E.I.M.' process, are based on the gasification of light mineral oil in air and steam. The processes are continuous in operation, and in this way a considerable cheapening in the capital cost of the plant is achieved.

The coal crisis in this country in the winter of 1946-47 brought forth many ideas for the gasification of oil in existing gasworks plant but most of the methods proposed were of an emergency nature and could not be regarded as economic.

A few typical analyses, extracted from the literature of the gases derived from these various processes are given in Table 1, and also, for the purposes of comparison, the characteristics of a normal town gas of 500 B.Th.U./cu.ft. calorific value, derived from coal.

Table 1.—Typical Analyses of Gases derived from Various Processes compared with a Normal Town Gas.

Type of plant	*C.W.G.	Jones process	Hall process	G.L.C.C. process	'G.E.I.M.' process	Normal town gas
Oil used	Gas oil	Fuel oil	Fuel oil	Gas oil	Gas oil	—
Composition of Gas :						
CO_2	5.6	3.2	5.8	2.7	3.0	3.5
O_2	0.4	0.6	0.1	0.4	0.9	0.4
C_nM_m	7.0	3.3	30.5	15.3	14.0	2.4
CO	30.5	15.5	2.6	10.0	11.0	14.0
H_2	37.0	49.8	11.9	2.7	2.2	51.0
CH_4, etc.	14.0	22.8	27.4	9.8	7.4	22.3
N_2	5.5	4.8	21.7	59.1	61.5	6.4
Specific gravity (air = 1)	0.63	0.464	0.915	1.00	0.943	0.45
Calorific value (B.Th.U./cu.ft.)	500	520	1,000	500	465	500

* Extracted from *Technical Data on Fuel* (Ed., H. M. Spiers), 5th Edition, 1950.

It will be noted that, with one exception, the processes produce gases of high density compared with normal coal gas, the proportion of unsaturated hydrocarbons being generally high and that of hydrogen low. This dissimilarity between the gases derived from oil and coal, respectively, has up to the present limited the amount of oil gas that can be used in admixture with normal coal gas without upsetting the behaviour of the appliances in which the mixed gas is to be used. One of the objects of the present investigation has been to produce from oil a gas sufficiently similar to coal gas as to be usable with it in any proportion. It will be observed that the Jones process does in fact give such a gas, but unfortunately the desirable characteristics have only been achieved as a result of the very high temperatures used for cracking, giving rise to large amounts of carbon black in the crude gas. Not only does this reduce gas-making efficiency, but the separation of this solid phase from the gas is a rather costly procedure. Indeed, it is probable that the process depends for its economic success on the market for carbon black.

* From a paper to the Institution of Gas Engineers, November 28, 1950.

Carbon in Oil Cracking

The formation of carbon in the gaseous phase, as in the Jones process, usually occurs when the cracking temperatures are unduly high (above 900°C), and, according to the theories of Bone and Coward, is attributable to the decomposition of the light gaseous unsaturated hydrocarbons.

The formation of carbon, in whatever state it occurs, and of tar, represents a loss in gasification efficiency, and any means of eliminating these by-products or reducing the amounts produced is well worthy of consideration.

An appreciable reduction in the amount of carbon formed and a corresponding improvement in the thermal yield of gas is achieved in the carburetted water gas process where, owing to the hydrogen-rich atmosphere maintained by the excess of blue gas present, hydrogen is absorbed in the cracking reactions with some reduction in the amount of carbon formed by polymerisation.

Then, again, in the former Gas Light and Coke Company's process it is claimed that carbon formation is almost entirely prevented by the controlled oxidation of the hydrocarbon vapours at low temperatures, the oxidation products then being decomposed into hydrocarbons, hydrogen, and carbon monoxide at higher temperatures.

A possible method of control of carbon formation, which does not appear to have received sufficient consideration, is that of gasification in steam. Normally the reaction of steam with carbon is too slow to keep pace with the formation of carbon in the cracking process, but if the reaction could be sufficiently accelerated it is conceivable that the production of carbon might be much reduced if not entirely eliminated. Moreover, it might be possible, with suitable catalysts, to introduce the elements of steam into decomposing hydrocarbon molecules and so modify the mechanism of the whole cracking process.

The possibility of using catalysts in the reforming of paraffinoid hydrocarbons in steam has already received attention in the U.S.A., and the results of some investigations have been published by the Research Production Committee of the American Gas Association. The aim of these investigations was to produce, by a continuous process, a gas of similar calorific value to coal gas from hydrocarbons ranging from the simpler paraffins to kerosene and gas oil. Nickelised alumina catalysts with varying proportions of nickel were used, and as a continuous process was desired, an important requirement was that no carbon should be deposited on the catalyst. Temperatures ranging from 700° to 950°C. and various space velocities were tried, but only in the case of the simplest hydrocarbons used—namely, propane and butane—could carbon deposition be avoided, and this only when the gas was converted almost entirely to carbon monoxide and hydrogen.

No successful result could be achieved with higher paraffins such as kerosene and gas oil.

The Committee concluded that, if carbon deposition were to be avoided and the process gas were to contain any appreciable proportion of hydrocarbons, a catalyst would have to be developed that promoted the steam/carbon reaction at low temperature, while at the same time retarding the cracking reactions. Apparently, no attempt was made to follow up this suggestion, and development seems to have been confined to the elaboration of the process for the conversion of propane to hydrogen and carbon monoxide, using propane itself for the enrichment of these gases.

The American Committee's choice of catalyst would seem to have been a rather unfortunate one. Nickel is usually regarded as very active in promoting the thermal decomposition of hydrocarbons and would be expected to accelerate, rather than retard, the deposition of carbon, while alumina, though possessing hydrolytic properties, is not a particularly active catalyst for promoting the steam/carbon reaction.

The work of Cobb and others has shown that, for the gasification of carbon in steam, sodium carbonate and lime are excellent catalysts. It was decided, therefore, to test the effect of catalysts of this type for the gasification of oil in steam, and a number of laboratory experiments were made for the purpose. In addition many other compounds were tested in a similar way, including the carbonates of the other alkali and alkaline earth metals, and also a number of metallic oxides known to have hydrolytic properties, such as activated alumina and natural bauxite.

It was clear from these laboratory experiments that catalytic gasification in steam, using an alkali carbonate or an alkaline earth oxide as catalyst, provides an excellent means of controlling carbon deposition in the cracking of petroleum oil, while at the same time giving a gas, low in unsaturated hydrocarbons and rich in hydrogen, suitable for distribution as town gas. Complete gasification, owing to the large proportion of water gas formed, gives a gas rather too low in calorific value for direct distribution, but very suitable as a diluent for rich coal gas. If the gas is required for direct distribution it would be necessary to raise the calorific value by limiting the amount of carbon gasified. This can conveniently be done by reducing the steam oil ratio while at the same time increasing the oil throughput to maintain a constant space velocity. Thus, under the given conditions of temperature and time of contact, gas of about 500 B.Th.U./cu.ft., of a specific gravity 0.44, would have been obtained with a yield of about 1.34 therm per gal., using a steam oil ratio of just under 1:1. Carbon corresponding to 25 to 30% of the oil by weight would have been deposited on the catalyst with very little formation of tar.

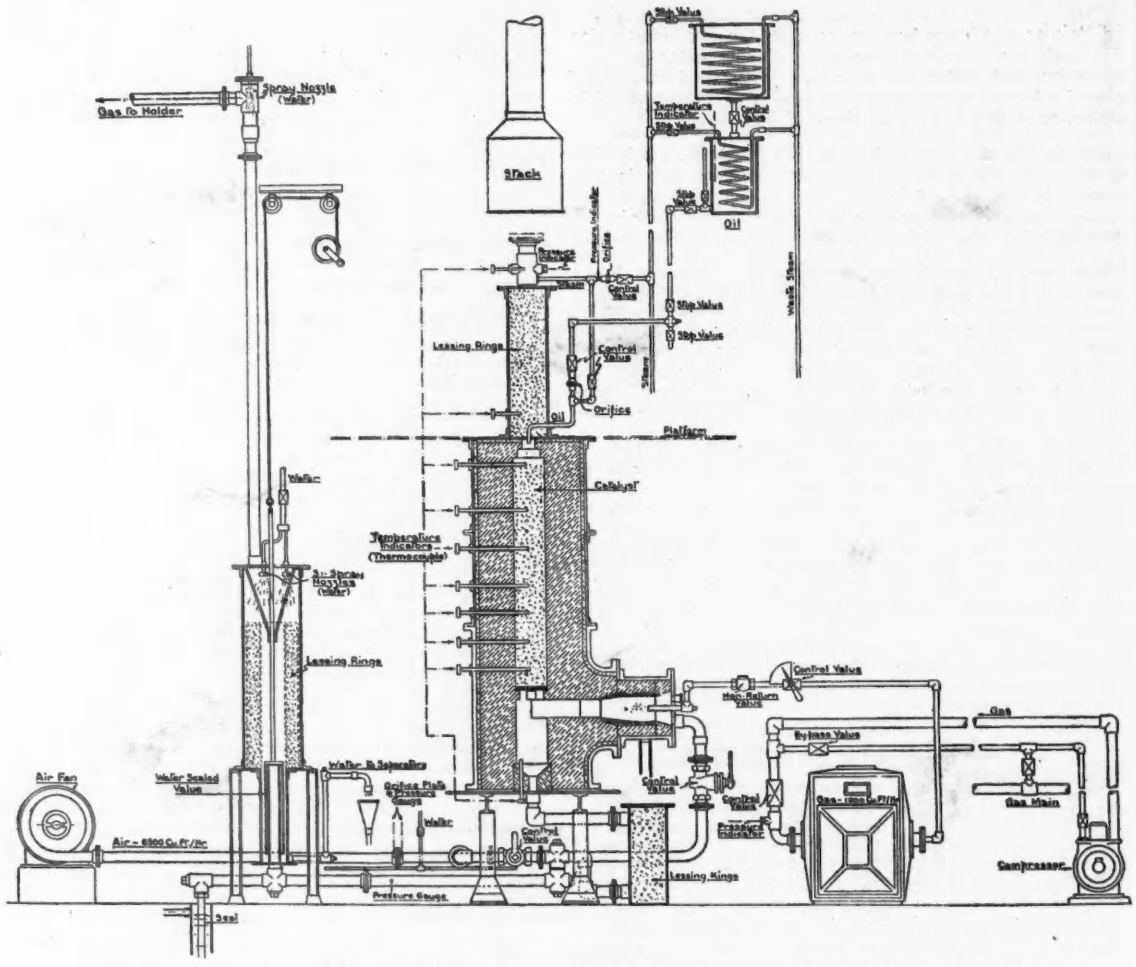
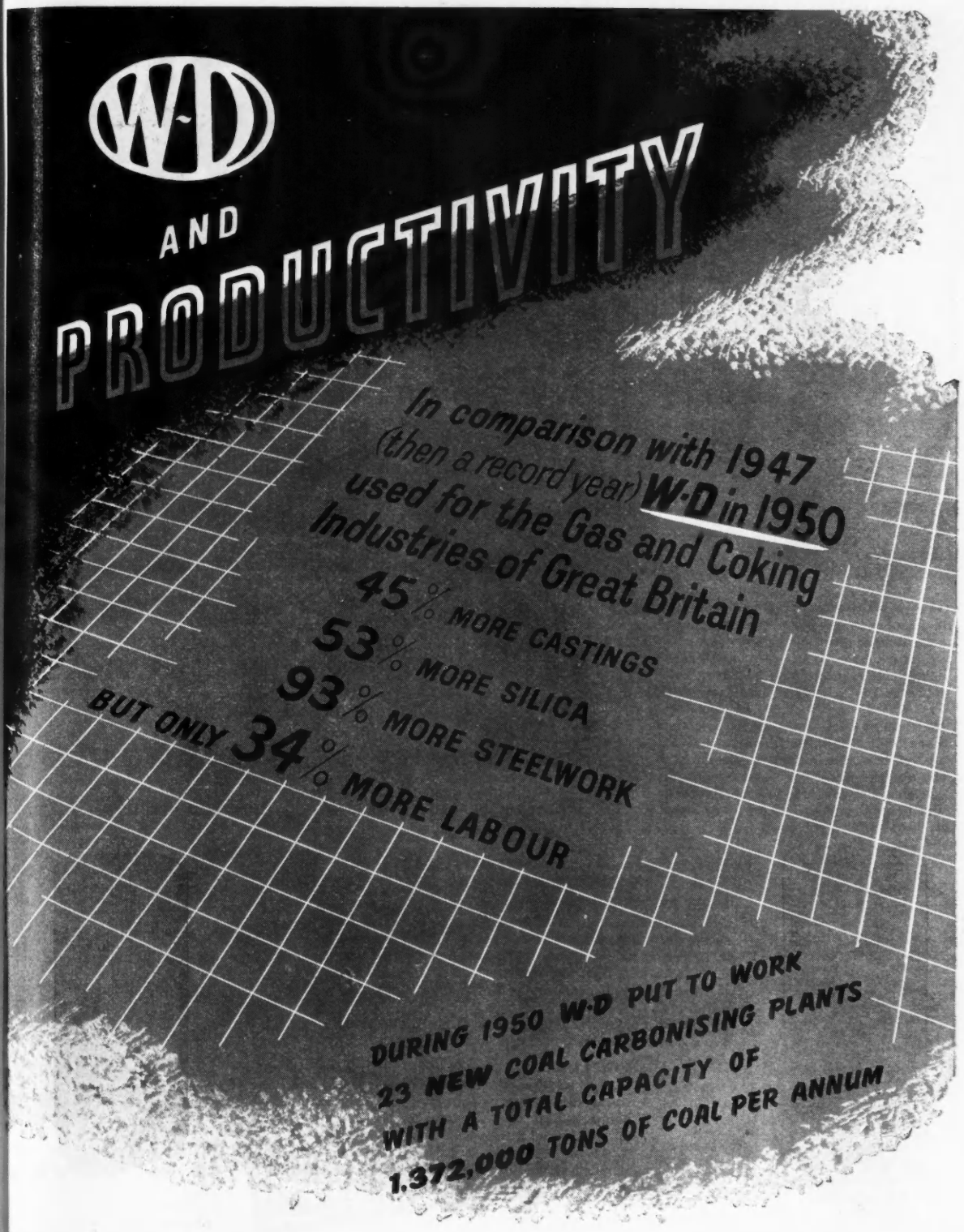


Diagram of experimental oil gas plant with a capacity of 2,000 cu.ft. per hour. (Scale: 1 in. = 4 ft.).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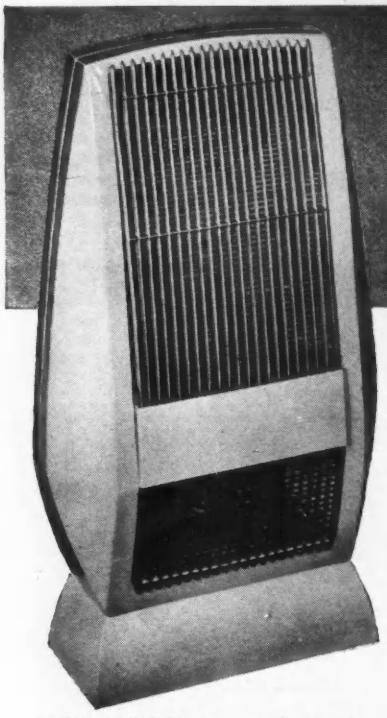

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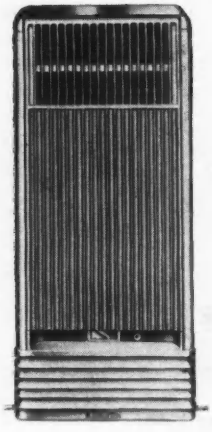

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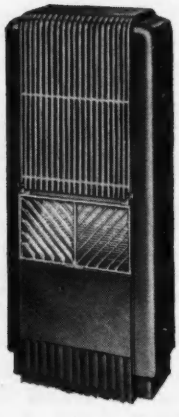

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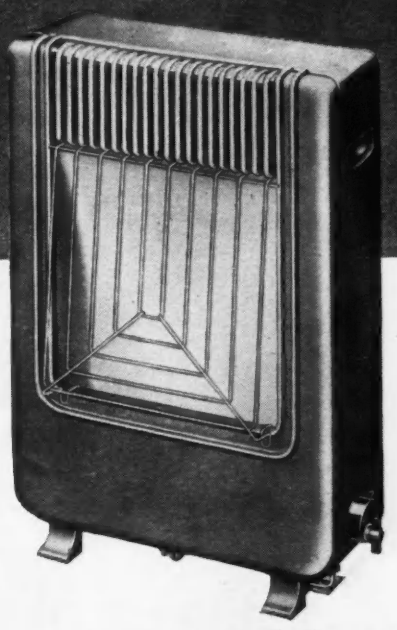

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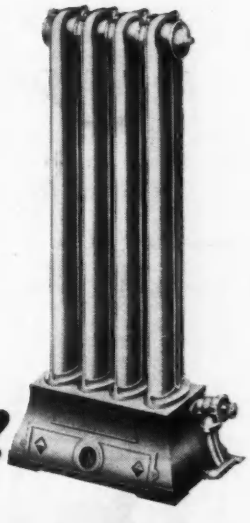

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Laboratory experiments having shown that, by the use of suitable catalysts, it was possible to produce from oil and steam a gas with the desired characteristics, it became necessary to consider developing the process to commercial scale.

The pilot plant as finally constructed is illustrated in Fig. 1. Essentially, it consisted of a 36 in. dia. steel sheel, 9 ft. 6 in. long, insulated so as to leave a central cylindrical chamber 10 in. in dia. The active surface required for the reactions was given by 1½ in. catalyst shapes, prepared as already described, supported on a carborundum grate to a total depth of 6 ft., there being about 1,800 such shapes in the 3.3 cu.ft. of active volume. Towards the base of the unit provision was made for the admission of the air and auxiliary gas used to restore the chamber temperature at the end of the gas-making periods. Provision was also made for some degree of heat regeneration from the make gases and waste blow gases.

Full facilities were provided for controlling and measuring the quantities of oil, steam, air and gas used; pressures were taken over all parts of the plant and temperatures measured at points 12 in. apart over the catalyst bed. It should be made clear that it was not possible to record the temperature at all points in the catalyst bed and that during gas-making and re-heating periods the changes in temperature were extremely rapid. For these reasons the temperatures given by the thermo-couples should be considered only as reference temperatures.

During a gas-making period, steam, at 700°C. from the regenerator, and oil were fed separately to the top of the catalyst bed and the gas made passed through a scrubber-cooler to a calibrated holder. After the run, air and any heating gas required were then admitted in the reverse direction until the catalyst temperature had been restored.

In view of the rapid fall in temperature in the catalyst bed it was seldom found desirable to extend gas making beyond 3 min., followed by a ½ min. purge with steam. The reheating period was approximately of the same duration and, when only a moderate proportion of steam was used with the oil, sufficient carbon was deposited to supply most of the heat required to restore the catalyst temperature, but care had to be exercised to avoid fusion of the catalyst through too rapid combustion. It was generally found that gas was not required during reheating periods except towards the end, when there was a tendency for the temperature of the lower part of the bed to fall too much. It should be noted, also, that it was generally possible to operate the unit so as to give, at the commencement of a gas-making period, temperatures at the top of the catalyst bed higher or lower than at the bottom, but it was difficult to achieve an even temperature throughout the bed. With the higher top temperature conditions it was found that the bottom of the catalyst bed remained substantially constant in temperature during the run, the marked changes occurring only in the upper half. When operating with the initial temperatures lower at the top than at the bottom, the fall in temperature occurred throughout the bed.

The experiments on the pilot plant were carried out both with gas oil and with heavy fuel oil, those with gas oil serving as a comparison with the work in the laboratory apparatus before proceeding with the cheaper raw material.

Typical analyses of the oils used are given below :—

	Gas oil	Heavy fuel oil
Specific gravity at 60° F. ...	0.850	0.945
Viscosity (Redwood No. 1 at 100° F.)	35 sec.	950 sec.
Calorific value (gross) :		
B.Th.U./lb.	19,600	18,700
Therms/gal.	1.67	1.77
Distillation range* :		
Initial boiling point	195° C.	191° C.
5% at	229° C.	248° C.
30% at...	268° C.	336° C.
60% at...	297° C.	—
90% at...	334° C.	—
Final boiling point	369° C.	—
Ultimate analysis :		
Carbon...	85.3	83.7
Hydrogen	12.9	11.7
Sulphur	0.5	3.31
Nitrogen	1.3†	0.18
Oxygen...		1.1†
Conradson carbon	Negligible	8 to 10

* Heavy fuel oil begins to decompose above about 250° C. † By difference.

Pilot-plant Experiments

(a) *Gas Oil*

The experiments with gas oil clearly established that a yield of about 1.3 therm of gas with a calorific value of about 500 B.Th.U./cu.ft. could be obtained from 1 gal. of gas oil, given the correct conditions.

(b) *Heavy Fuel Oil*

Again, it was clearly established that a gross yield of at least 1.3 therm of gas of 500 B.Th.U./cu.ft. could be obtained from 1 gal. of oil, in this instance heavy fuel oil, given the correct conditions of oil rate, steam oil ratio and temperature.

Probable Costs of Oil Gas

From the results obtained on the pilot plant, and bearing in mind the limitations that exist in this plant, but should be avoidable in a larger commercial unit, there should be obtained a net yield of 1.3 therm of gas of 500 B.Th.U./cu.ft. from 1 gal. of heavy fuel oil. At the present price of heavy oil of 7½d. per gall. (after allowing for all rebates), the cost of oil per therm of gas would be 5.48d. This figure for net materials cost is about the same as the net coal cost for carbonising plants in situations where the freight charge is heavy. It is between 1d. and 1½d. per therm more than the net cost of coal at works in the London area receiving water-borne coal. It is appreciably less than the net raw materials cost for carburetted water gas of 500 B.Th.U./cu.ft.

Clearly, the capital cost of plant to operate the process cannot be given at the present stage of development, but it is probable that the commercial unit will closely resemble a carburetted water gas plant, both in size for a given output and in the nature and construction of the vessels, except that there will be no need for a grate or ash-handling equipment and no need for coke-handling equipment. All operations could take place from a small building housing the machinery and control gear, making it unnecessary to house the main vessels. On these grounds it is reasonable to expect the capital cost to be substantially less than that of a carburetted water gas plant of equal output. It is known that the capital cost of carburetted water gas plant is about one-third that of carbonising plant of similar output. The capital cost of oil gasification plant may be between one-quarter and one-fifth that of carbonizing plant. Operating wages should not exceed those of carburetted water gas plant.

These factors of lower capital cost and lower wages cost should cover the difference in net materials cost between oil gas and coal gas, and it appears not improbable that in the South of England gas of 500 B.Th.U./cu.ft. may be made from heavy oil as cheaply as it can be made in carbonising plant even at 100% load factor and on the most favoured sites. Where the situation and load factor are less conducive to low cost a substantial advantage will lie with oil gasification.

DISCUSSION

Mr. **J. E. Davis** (Chief Technical Officer, South Eastern Gas Board) said that the work started through the adoption of an intensely critical attitude of mind. A few years ago, during the coal crisis, the Ministry of Fuel and Power advised those undertakings with horizontal retorts that they could probably cope with the situation by using a certain process for the gasification of gas oil in those retorts. They themselves had a look at the process, and frankly they did not like it; they thought of the probable emulsion which would be made between the gas oil and coal tar, particularly as it was likely to be partially oxidised gas oil, and they decided that they were not going to risk it unless they could isolate the settings. They were glad afterwards that they took that line. They also felt it unfortunate that, since the gasification of petroleum hydro-carbons required the addition of hydrogen, this particular process, with its combustion of the hydrogen content of the oil, had some disadvantage, and so they came to the conclusion that they could do better.

Just over two years ago, Dr. Maccormac, of the former Gas Light and Coke Company, gave an informative and useful Gas

Research Board paper on the use of gas oil and a gasification process for meeting peak loads. That process, as was well known, had done good service in coping with present difficulties. At the same time, on the other side of the river the critical attitude of mind had led to a very similar programme, aimed at the same objective. It might at first sight have been said that there was duplication of work and overlapping. That was so, but he felt that in the work which had been done there was a very important lesson for them at the present time. If two separate teams of men started out on research with the same nominal objective, the ways in which the research might unfold and branch out, the different directions in which it might go and the different goals which it might attain, might make duplication worth while.

The other point which he would like to make in opening the discussion was that he felt that there was a great deal of promise in the process described. The ability to go on living, of an organisation or an organism, depended upon its ability to adapt itself to circumstances. Those in the gas industry were well aware of how, in past history, the switch-over from the lighting load to the heating load enabled the gas industry not only to continue to live but to grow very rapidly, but all the time they had been relying on the one fundamental asset, the availability of plenty of coal of good quality. It was well known that it was not possible today to look forward either to plenty of coal or to coal of the quality which they would desire. If they could now bring in oil, and particularly oil which was likely to be a residual product from oil refining in this country, to help them as a second raw material, then they would have shown once again their adaptability to changing circumstances and have increased the likelihood of their continued existence.

However, even though for the next two or three decades the use of petroleum might help the gas industry to overcome the difficulties associated with the shortage of coal, if they were to make the best use of what coal there was in the country he still believed that as a long-term programme of work and as a long-term objective the work which Dr. Dent was doing at Poole on the total gasification of coals hitherto regarded as quite unsuitable for the gas industry should be the next step ahead in this game of leapfrog.

Orderly Development

Dr. **H. Hollings** (Chairman, Gas Research Board) said that the paper described the orderly development of a new process through the various stages from the study of a laboratory reaction to the building of a unit plant having a capacity of 1 mill. cu.ft. per day. There were several reasons why it was necessary to strive in this country to establish a gas-making process based upon oil rather than coal for various emergency uses, and there were obviously further advantages in basing that process upon a heavy fuel oil rather than upon a distillate oil such as was necessary for the French G.E.I.M. process or the process which Dr. Maccormac proposed at a meeting of the Institution two years ago. It might well be that in the process described by the present authors there was a very serious competitor to the process which was now being developed and extended by the North Thames Gas Board. Moreover, the process might compete with certain American processes, because there was no heavy deposit of carbon to be removed from the plant by manual labour.

Again, one was struck by the high thermal efficiency of the process. This depended, of course, upon the proper use of the carbon deposited in the cracking of the oil, some for water-gas manufacture and some for the internal heating. High yields of hydrocarbons, by and large, were accompanied by high yields of water gas. It was very important thoroughly to understand the chemistry of the process, because in a new development of the kind in question it would never be possible to get the engineering right unless the chemistry was quite clear first. He would like to ask whether the authors agreed that the catalytic formation of water gas was the controlling reaction, and that when this fell off the carbon, no longer gasified, absorbed hydrocarbons which cracked on the surface, giving still more carbon and so still further impeding the catalytic effect. Perhaps there would be room for two oil-using processes. The Gas Light and Coke Company designed their process over two years ago as an auxiliary to other gas-making units for use at times of peak load; it was never intended as a base-load plant, though for a short time recently it had been so used in circumstances over which they had little control. The Gas Light and Coke Company process had the advantage, apparently, of lower capital cost, a very important matter if one were thinking of peak loads only, but the high specific gravity of the gas limited its use in many circumstances. At what would appear to be a rather higher capital cost, the authors produced a gas with physical properties which would be more generally acceptable. It might well be possible to distribute that gas unmixed with any other gas, and, if that were so, it might be a useful plant for the relatively small, isolated community for which he believed that some area boards were looking.

There would, of course, be difficulties in perfecting a new process of the kind in question, and the authors would need to exercise great patience in dealing with the many people who would want to know, in so many days, for how many years the catalyst would last without poisoning or spalling, while others would want to be assured that the liquid condensates from the gas were not going to cause any difficulty, and would want to know whether in fact there was no emulsion resulting from any traces of carbon carried forward.

Mr. **N. H. Williams** (Humphreys & Glasgow, Ltd.) remarked that early in their paper the authors referred to American work. In view of the very great usefulness which a process such as that described would have had in the United States for at least two decades, it seemed remarkable that a process of this type was not forthcoming years ago from this source, particularly so when it was realised that as far back as the 1920's German workers drew attention to the incorporation of lime and metals of the alkaline earths in catalysts for promoting the gasification of hydrocarbons of various sorts by reaction with steam.

For Base Load C.W.G. Manufacture

His Company's associates in France were faced some while ago both with the desirability of catalytically reforming available natural gas and with the insistence of Gaz de France that fuel oil should replace gas oil in the gas industry. His Company collaborated with its associates, and the aspect which initially appeared to be of most interest to the British gas industry was the use of fuel oil for base load C.W.G. manufacture. The successful production, however, of a cyclic catalytic process for making town gas from natural gas suggested that a similar technique might be successful with oils. This was found to be the case, first with gas oil and then with fuel oil.

The guarantees given corresponded to a process efficiency of 70%, which it was confidently expected would be well exceeded. It was emphasised, however, that a great deal of work remained to be done before anything like finality of design was attained, particularly in view of the variety of circumstances to be met. It might be mentioned in passing that no difficulty had been experienced from sulphur when gasifying fuel oils containing 3% of this element, and none was anticipated with even higher sulphur contents.

Meanwhile, the first of the modern C.W.G. plants designed specifically for the use of fuel oil, based on recent work of themselves and their associates, had lately been put into successful operation, using a method capable of adaptation to the majority of existing plants with minimum structural alterations. This method avoided, of course, any necessity for manual removal of carbon.

From what he had said it would be appreciated that his Company had long been alive to the possible future importance of fuel oil in the manufacture of town gas. He would, nevertheless, counsel a certain caution concerning the availability to the gas industry of large surpluses of fuel oil, for it was a salient characteristic of the oil industry to reserve to itself the right to adjust production between its various products to give at any time the maximum net revenue. This would, no doubt, be evident when negotiating forward contracts for fuel oil supplies. The attention of the oil industry had already been drawn to the possibility of converting its heavy oil residues via gasification and synthesis into more valuable products.

Dr. **J. G. King** (Director, Gas Research Board) complimented the authors on the manner in which they had expanded the academic work on the reforming of hydrocarbons and practical work in the form of the old Pacific Coast gasification system and produced a new method which would include as a fuel so refractory a material as heavy fuel oil. He agreed with them that the investigation had to be empirical to an extent in order that progress should be made quickly, but he felt that, now that this progress had been made and a very

considerable measure of success attained, it would be profitable to examine in some detail the reactions concerned in the process. No process could be an engineering or practical success without a firm foundation of scientific fact.

In thermal cracking, the factor of prime importance was the hydrogen content, or the hydrogen/carbon ratio, of the cracking stock. With a heavy fuel oil of the type with which the authors had dealt—$C_{24}H_{11\cdot7}$—it was apparent that reduction to a lower molecular weight, particularly in the olefine series, must mean a very considerable separation of solid carbon, unless in the course of the formation of these hydrocarbons a secondary reaction was provided to gasify this carbon, preferably before formation.

The important issue was, of course, to gasify this carbon as it was formed and before graphitisation began. Once graphitisation had proceeded, it was unlikely that gasification could happen in the short time available. In the retort method of making oil gas the carbon deposited was very high; it was as high as 40%; but in the partial combustion method known as the Dayton process this was reduced to a very small amount indeed by superimposing a secondary reaction. In that case, however, the difficulty was that the gas made had a high specific gravity.

The authors were well aware of this and introduced steam apparently, or rather obviously, with the objective of gasifying the carbon formed in the breakdown of olefines, which might be regarded as the primary products. It would certainly be helpful to examine the reactions, as suggested, treating simple olefines with steam under controlled conditions in order to determine whether a reaction chain was formed which included the important reaction of hydrogenation of these hydrocarbons.

Considerable Carbon Liberation

When treating an oil so deficient in hydrogen as heavy fuel oil, however, it was certain that there must be considerable liberation of carbon, even during the formation of the olefines, and it must be necessary also to control the deposition of this carbon and if possible to gasify it also. He was sure that the authors were well aware of this. He did not know whether an alteration of pressure would be welcomed in a process of the kind in question; it would perhaps be an unnecessary complication in a gas production plant; but it was known that at reduced pressures the yield of olefines as a primary product in the cracking of oils was greatly increased. At pressures of the order of ¼ atm. instead of 1 atm., the yields of olefines from a gas oil might be as high as 75% out of a theoretical quantity of perhaps 90%.

That was perhaps a useful pointer to the authors, and, if the idea of introducing a low-pressure system did not present other difficulties, they might consider whether this would effect some diminution in the carbon formed during the formation of olefines. It might be that the independent study of both phases would lead to reduced carbon formation and therefore to a higher gas yield. Working under those conditions might unbalance the process as a complete entity, in that the heat available from the combustion of the carbon deposited would not serve for the thermal requirements of the process; but this was not a very important matter, since frequently in a works steam was available—by-product or waste steam—which was cheaper than the steam which would be formed in this self-contained manner. On balance, therefore, from the point of view of plant efficiency as a whole it would be wise to study the reactions further in the laboratory. It might be possible, for example, to achieve the very high carbon efficiency of the Dayton process, which involved some oxygen, but with a gas of lower specific gravity.

The considerable changes of temperature to which the catalyst was subjected must necessitate considerable powers of resistance to breakdown in the catalyst, and he would like to ask whether the authors were satisfied that a catalyst having sufficient life was available to them. It was interesting to observe that in the best results put forward by the Pacific Coast process the simple efficiency of gas-made/oil-used was about 55%, so that the authors' introduction of a catalyst in the process had raised the efficiency from the level of 55% to something like 67%, a valuable contribution, by the use of an alkaline catalyst.

The authors had suggested the use of a fluidised bed, but he thought that they would run into serious difficulties with this technique with so high a deposition of carbon as they had shown, of 1 lb. per gal. In the catalytic cracking of petroleum, the circulating catalyst was continually regenerated to keep its carbon content as low as 0.5%. It might not be necessary to go to so low a figure as that in the present case, but it seemed to him probable that, using the fluidised technique, there would be serious difficulty due to carbon deposition.

Dr. G. Milner (Power Gas Corporation) said that the brief communication which he wished to make was the joint effort of Mr. J. E. Knight, also a member of the Institution, who was the official of their Company responsible for the commercial development of this process, and himself. The need for a process of the type in question had long been recognised in the industry, in order to overcome the weaknesses of such gases as carburetted water gas, producer gas, and so on for assisting at peak loads. They believed that the authors had clearly interpreted the requirements of such a process. The programme had been well planned in the laboratory and pilot plant aspects, and had been well carried out. The authors had already developed a catalyst, and had indicated those conditions in which a commercial plant capable of manufacturing town gas from heavy oil could be successful. The value of their work was particularly emphasised at the present time by the shortage of coal and the possibility of large amounts of heavy fuel oil being available during the next few years, and it was of particular significance that the use of heavy oil had been successfully demonstrated on a pilot plant scale and that even with such a raw material there was an indication that the production of tar would be very low, and any problem likely to arise from the disposal of such a tar should not cause great difficulty in its solution.

High Thermal Yields

Attention should also be drawn to the very wide variation in quality of the gas produced, particularly in respect of its calorific value and specific gravity, which rendered the process generally applicable in all parts of the country, irrespective of the local declared standards. It had also the merit that the thermal yields appeared probably higher than could be achieved in normal carburetted water gas practice.

His Company at the present time were collaborating with the South Eastern Gas Board in the design of a commercial unit suitable, they hoped, for continuous operation as a working production unit which might be suitable either for meeting peak loads or, in the case of small country districts, as a base load plant. It might be advantageous to indicate the features which they had in mind. They believed that the immediate application would be as a peak load plant, and their first object would be to develop a unit in which the capital cost per unit of gas produced was sufficiently low to make the process or the plant attractive under conditions of peak load costing. The plant should be simple to operate and able to produce gas rapidly from cold.

The results so far obtained on the pilot plant had demonstrated that the process could be worked cyclically, and that the carbon deposited during the gas-making phase could be burnt off during the blow period, thereby providing the heat to maintain the catalyst bed at the temperature required to promote the steam/oil and steam/carbon reactions which were involved.

In their first consideration of the subject they had had in mind a plant similar in design to the conventional carburetted water gas plant, which might consist of two or three brick-lined cylindrical steel vessels. It would have the advantage of eliminating the costly grate and mechanical ash extraction associated with the carburetted water gas process. The plant would incorporate a catalyst vessel, a steam pre-heater, and an air pre-heater. In the smaller size it might be advantageous to superimpose the steam superheater upon the catalyst vessel, a design which was adequately proved during the war on many of the Air Ministry hydrogen plants. In the larger types, mechanical considerations would probably involve the use in the design of a three-vessel type of plant. The admission of oil to the catalyst bed and the admission of air and the supply of steam would follow conventional methods, all of which were well established.

They anticipated that such a plant would operate with approximately equal periods of blow and run, and if installed as a twin unit it should be a practical proposition to have continuous gas production without the necessity of a relief holder, or with at the most a very small holder. The plant could be arranged for automatic movement of the valves and should readily be adapted to the use of either mechanical or hydraulic control. Waste heat recovery from such heat as

was available should follow conventional methods, and in turn offered no difficulty.

It seemed probable, however, that the combustion of the carbon deposited on the catalyst might involve problems which could be solved only on the larger-scale unit. From a thermal aspect alone there should be adequate heat available, but it might be necessary to facilitate the control of temperature distribution in the catalyst by the use of a small amount of auxiliary heat. It might also happen that the excess heat available might result in uneven heating or local over-heating of the catalyst bed, and means might have to be adopted to dissipate such heat. These problems, however, could be solved only on the large-scale unit, and, like the authors, they were anxiously looking forward to this unit being put to work.

Mr. **A. G. Grant** (Whessoe, Ltd.) said that a paper such as that under discussion introduced broader issues than the technicalities with which it dealt. One such issue had been referred to by Mr. Davis, namely, that parallel work had been done by the North Thames Gas Board and the South Eastern Gas Board. Personally, he was very glad that that was so. He sincerely hoped that in the new gas industry there would be no sense of monopoly, and no thought that because the 'North North-East Gas Board' was investigating a problem, other boards were debarred from doing so. In the steel industry, the chemical industry, the oil industry, and the old gas industry great help came from the fact that many people were working on a parallel problem.

Secondly, it was necessary to take every opportunity in the gas industry in general and in the Gas Research Board and the organisations doing research to look at what their sister industries were doing. The oil industry had an experience which the gas industry could not rival in playing about with molecules, taking the complex molecules of petroleum and isomerising them, cracking them and generally playing about with them to get what they wanted. The South Eastern Gas Board had described one of these processes. He thought that they could always get help from the oil industry, particularly in America, in a process of that kind, and he thought that they ought to get it. For example, the Dayton oil-gas people were reforming 1,000 B.Th.U. natural gas to 500 B.Th.U. and getting something like 95% efficiency in their reforming.

The third reflection was that however much they might use a by-product of the oil industry in the shape of heavy oil they must ultimately come back to coal as their raw material. He would support Mr. Davis in saying that they must concentrate on the use of their coal on modern lines. Personally, he was of opinion that the work which Dr. Dent had been doing was the right way of handling coal. He only wished that they could have had the imagination and the money and the research staffs that the American oil industry had had in dealing with their raw material to apply to the raw material of the gas industry.

Mr. **J. B. McKean,** in reply, said that the authors would prefer to give a considered reply to the discussion in writing, but he would like to mention one point to which Dr. Hollings referred in asking whether the catalytic formation of the water gas was the controlling reaction in the process. That was probably to a large extent the case. In some experiments which they carried out they had a lot of carbon formation and the gas which was formed became unsuitable for the purposes which they had in mind.

There were a number of points which they would have to study on the full-scale plant—the life of the catalyst under continuous working conditions over long periods, and the heat available from the waste gas and the gas which was leaving the plant, the oil gas, so that they could make a process which was highly efficient. They hoped that at an early date they would be able to answer those questions.

Education in Gas Industry

The discussion on the 27th Report of the Gas Education Committee at the research meeting of the Institution of Gas Engineers, of which the following is our report, was valuable and stimulating, a happy feature being the views, admirably expressed, by a student in the gas industry who has learned by the hard (perhaps the only) way.

MR. **J. H. DYDE** (Vice-President of the Institution) said that since the period covered by the report certain changes had taken place in the Gas Education Committee. This would be the last occasion on which Mr. John Terrace would come before a meeting of the Institution to present the report on gas education schemes and the work of education in the industry. Mr. Terrace had been Chairman of the Gas Education Committee since 1938 and had given great personal service to the industry in promoting one of the main objects of the Institution's Charter. Mr. Dyde said that the fact that he had had the honour of being asked to assume Mr. Terrace's mantle of office and continue his work did not make his remarks a mere formal appreciation of the services which Mr. Terrace had rendered. Everybody, including large numbers of students, owed to Mr. Terrace a very great debt of gratitude.

Certain changes had taken place in the constitution of the Gas Education Committee. The number of the Institution's representatives had not been changed, but there had been the resignation of two members who had done yeoman service in the past—namely, one of the Past-Presidents of the Institution, Mr. E. Crowther, and Mr. D. C. Cross. Their places had been taken by two men from the industry who had shown locally that they had a keen interest in education and were well qualified, as a result of their experience, to serve on this important Committee.

The Committee had also been strengthened by additional representation, and first of all representation from the Gas Council; Dr. A. B. Badger had come to provide the essential link with the national gas industry. In addition, for the first time they had asked for special representation from the Society of British Gas Industries in the form of two representatives, one who would represent the contracting side on the production side of the industry and the other the appliance manufacturing or general utilisation side of the industry. It must not be forgotten that very many first-class engineers, chemists, and technicians on this unnationalised side of the industry were to be found in the contracting firms, and their interests should be served on the broad Committee of the Institution dealing with education. They had been very pleased, therefore, to welcome two men who were well known to members of the Institution—Mr. F. Brinsley, of the technical service staff of Radiation, Ltd., and from the plant production side Major W. Gregson, who was a Past-President of the Institution of Mechanical Engineers.

He would like to refer to the Gas Council's own Committee which dealt with education and training in the industry. As was well known, section 4 of the Gas Act imposed on all area boards the duty of providing schemes of education and training for all classes of personnel, not merely the technicians, but the craftsmen and others. Those schemes had to be co-ordinated by the Gas Council. The Committee which the Gas Council had set up to deal with this immense task included, he was glad to say, representation of the Institution of Gas Engineers, and Dr. Braunholtz, Mr. Le Fevre, and himself were acting on that Committee. Moreover, to ensure the establishment of liaison between the Institution, in the schemes which it had developed over the years on education, and the Gas Council, the Gas Council had asked that the

Assistant Secretary of the Institution, Mr. Higgins, should also act as Secretary of the Gas Council's Committee. Altogether it was, as would be seen, a very happy relationship.

It would not, perhaps, be appropriate for him to record, except in the most general terms, the work which the Committee had already accomplished, but he could say that recommendations with regard to a comprehensive scheme for pupilage and training, involving part-time release for approved trainees, had gone forward from the Committee to the Council, and in fact to the Minister, and had been approved and sent forward to the area boards, to act as a basis upon which they could formulate their plans for general education and training.

The Institution's examinations, leading to professional qualifications, were of course accepted by this Committee, as were also the technological certificates in gas manufacture and supply of the City and Guilds of London Institute. Such examinations would be most useful to those who, while not aspiring to full corporate membership of the Institution, nevertheless required an academic qualification which would serve them in their office as supervisors, foremen, and so on in the gas industry. There had also been acceptance of the certificate of salesmanship and consumer service as an appropriate qualification for district representatives and salesmen generally.

From this he hoped that it would be gathered that in a year of adjustment the needs of the future had been catered for and an attempt made to meet the changed conditions arising out of nationalisation.

Two Causes of Failure

Finally, he would like to refer to one or two matters arising out of the reports of the Board of Examiners. He knew that there were quite a number of people who were concerned about the low standard and large percentages of failures shown in the 1949-50 results. He felt that this was due to two causes. There was first of all the effect, on the students now coming forward, of the disturbance of their education, and in fact of their minds, by the war years. At a recent Gas Education Conference, principals of the leading technical colleges and institutions reported this as a general statement of fact. The same deterioration of standard was found in the examinations of other professional bodies; it was part of the price which was still being paid for the war years.

The second reason was that 1951 marked the beginning of their new Associate Membership examination scheme, and as many students as possible were being pushed forward, in some cases, to take the examination before they were fully prepared, so as to have the advantage of qualifying at a somewhat lower standard of attainment. He knew that it might be argued that a student could not take the examination before he had completed a scheduled number of hours, but the fact remained that some students required a longer period of time for the assimilation of the full syllabus, and the amount of time which the Institution stipulated must really be considered to be a minimum.

He would like to say a word on the scathing criticism of the examiners on English and the presentation of subject-matter. He did not think that the teachers of technical subjects could be blamed for this. They had a very big syllabus to deal with. The trouble went much further back, and he thought that it could be corrected by the students themselves by reading good literature and doing exercises in précis work. To that end he would appeal to all seniors who had students in their charge to give them all the help possible in this matter, by calling, for instance, for a report from time to time giving an appreciation of a problem, the recommended action to be taken, with supporting reasons, and the anticipated results. That sort of exercise should greatly improve the position.

Dr. **P. C. L. Thorne** (Minister of Education) said that he would like to pay a tribute to the untiring work of Mr. Terrace. It had been his privilege to work with Mr. Terrace in fair weather and in foul, both on the Committee and in the educational field generally, for many years. Mr. Terrace's activities had been many and varied, and it was to be hoped that he would long be an inspiration to the Institution and to its Education Committee.

The present was a time of transition in several ways in the development of education for the industry. The Education Committee had realised the importance of maintaining continuity between the old and the new at all levels. At the moment, the overlap produced a somewhat complex system, as was indicated in the report under discussion; but in practice, in the technical colleges and in the undertakings, the process of education went on vigorously. The numbers taking the examinations in gas fitting were larger than ever. Those taking technology of gas manufacture and supply were increasing slowly, as also were the candidates for the certificate in gas salesmanship and consumer service. The slow growth of the last three types of course was due to the length of the courses, so that those who started when they were first approved were only just coming through for examination.

The phenomenal numbers in the last year or two of the examinations under the old scheme of certificates of the Institution were readily understandable, and, although the results were not as good as might be wished, they at least indicated that there had been no lowering of the standards which the Board of Examiners had so carefully maintained during the currency of the scheme. The number and even the percentage of the failures was to be regretted, but at least it showed that large numbers of students were taking classes, and risking taking the examination possibly prematurely. They had at least learned something.

The future arrangements for the Associate Membership examination called for some comments. There were two avenues to this. The first was the external way, by Section A and Section B, Group VIII, of the Institution of Civil Engineers and the Institution of Gas Engineers. The second was the internal way, by the Ordinary National Certificate of the Institution of Mechanical Engineers as a preliminary qualification, and the Higher National Certificate of the above-named joint Institutions. The final standard was the same, and the same subjects must be covered; the real difference was that with the national scheme the teachers in the colleges set the papers, which were then assessed by assessors appointed by the Joint Committee of the Institutions. At present students were working for their Ordinary Grade certificates in mechanical engineering, and could not be identified, therefore, as gas subjects students. A number of schemes for the Higher National Certificate were in preparation, but none had so far been approved in England and Wales.

Time Off With Pay

For many years he had advocated the policy of time off with pay for employees of the industry to pursue at least part of their studies. This was now on the increase, and it was hoped that it might become a general rule. Only in this way could effective work be done by the majority, and it would be an important factor in attracting better types of recruit than had offered themselves in recent years in the lower grades.

There was another way in which the educational machine had been kept running during the last few disturbed years—namely, the annual week's course for teachers, which it had been his pleasure and privilege to direct for a number of years. It was clear that, whatever the final pattern, a corps of able teachers, with a knowledge of the latest developments and of the best methods of putting them across to students, would be essential. Last year the course was over-subscribed, with more than 100 applications for 65 places. It was proposed to hold another course from July 15-21, 1951, at Southampton.

The success of these courses depended to a large extent on the payment of the out-of-pocket expenses of those attending them by the gas industry. On the part of the Ministry, those expenses were kept as low as was consistent with comfortable conditions of work, and it was hoped to give even better value than in the past in the way of quality of instruction.

Mr. **H. E. Goodrich** said that he spoke as a comparative newcomer to the industry, having joined from the Forces only three years ago, and as a student who had recently passed the Ordinary Grade examination in gas supply and who hoped to take the Higher Grade examination in 1952. Accordingly, he wished to thank the Council of the Institution for being allowed to address the meeting on a subject which had been so close to their hearts for so long.

In many of the latest reports of the Gas Education Committee, the examiners had stated that they found the candidates' examination papers excessively weak on four points :—

(a) The form of presentation of the answers.

(b) The quality of the diagrams.

(c) The accuracy of the mathematical answers, because the student worked through the paper, wrote down the answer, and did not check it.

(d) Practical knowledge. The students obviously lacked practical knowledge; they had gained their knowledge in the

class-room, but had very little idea of how it related to actual district work.

In regard to the first three of those points, he would ask for some consideration to be given to the mental outlook of the candidate on the day of the examination. After some years of study and a few months' intensive cramming just before the fatal day, the candidate went to the examination room in much the same way that a man might go to the execution block. He was not ashamed to admit that he was nervous. When he finally saw the question paper, the nervousness and apprehension disappeared and were replaced by an intense desire to astound the examiners with the extent, scope, and detail of his knowledge.

It was only human nature for a man to try to do his best, especially after so long a time of preparation, but he could not do justice in a bare half hour to the average type of question set. If five minutes were devoted to thought on the subject: 'What is the best way to deal with this? How shall I set about that? Do I need to include the other? ' and then five minutes to checking through carefully what he had written when he had finished answering the question, that left him only 20 minutes, which was not a very long time, and in that time he had to write down concisely, logically, and chronologically his answer to the question, and in the final 10 minutes he had to draw a good, working diagram.

Ability of a Cartoonist

To draw such a diagram, illustrating all the points mentioned in his written work, in 10 minutes or less, required the ability of a first-rate cartoonist, which the candidate did not possess. If an average of only half an hour was allowed for each question the tempo of the examination did not allow the candidate to present his best work. The speaker was aware that three-quarters of an hour was allowed in the Higher Grade examination, but thought that this was still a little too short. He felt sure that if an average of one hour were allowed for each question the standard of presentation and of the diagrams would rise, unchecked answers would not be submitted, and a greater percentage of passes would result. He would emphasise the fact that a candidate could do very much better if he was allowed to take his time over a subject than if he had to rush it. In the new form of examination in Joint Section B, Group VIII, two three-hour papers were to be set, and he hoped it would be found that an average of one hour per question was allowed.

To make this extra allowance of time easier, he suggested that the present supply syllabus be divided into two sections, headed 'Distribution' and 'Utilisation.' This would allow a student to qualify for Associate Membership by passing an examination in any one of the following three sections:—(i) Manufacture; (ii) Distribution; (iii) Utilisation. The last two, Distribution and Utilisation, would be taken from the syllabus at present known as Supply. He felt that this measure would reduce the present gigantic size of the supply syllabus and give the student far more opportunity to cover his particular section of the syllabus in detail. It would result in better knowledge by the student of his portion of the syllabus. As the first examination under the new regulations had yet to take place, this seemed to be an opportune moment to consider dividing the syllabus.

In regard to the fourth point, the apparent lack of technical knowledge, he felt that this problem could best be solved by the area boards allowing students who would otherwise gain knowledge only in the class-room to obtain the district experience required. The lecturers might put their hearts into their subject and give a lecture with diagrams on the blackboard, but the students, though they tried hard, could not really take it in until they had actually seen it.

Finally, he would express the urgent and widespread need among students for a text-book, or a series of text-books, which would cover completely the various gas sections of the syllabus from the start to the finish of the course. A student in a class-room, listening to a lecture, had two major jobs. The first was to listen to the lecturer and absorb what he had to say detail by detail, and the second was to put it all into a notebook in front of him. Both jobs could not be done perfectly at the same time. For one student to keep interrupting the lecturer and asking him to go back to a point wasted time and held up the class, but if he did not do that his notebook would not be complete, and at night, when he wanted to revise the lecture, his notebook would not help him.

There was a very definite need for a text-book to replace the notebook which the student took to the lecture. There were in existence two very authoritative and much appreciated works which were a great help to students such as himself, and he was sure that, if others were written and made available to cover the now extended syllabus, with particular reference to gas laboratory practice, all students would be very grateful and would make exceptionally good use of them. The fact that they had them would make a very big difference indeed to the examination results revealed in the next report of the gas Education Committee.

Mr. **R. F. Hayman** (Watson House, North Thames Gas Board) said that the report of the examiners for this year in some respects made depressing reading, but, as a present member of that Board, he was prepared to take full responsibility for his share in the statements contained therein. Much had been said—and would always be said—concerning the problems of a suitable standard of technical education for students, but a phrase, or variations of it, which appeared with monotonous regularity in these reports was that students were lacking in the art of presentation and in good style. A fine example of that *not* applying had been given by the previous speaker.

It was no secret that the examiners, in marking a question, took due account of presentation and style. This aspect was not insignificant, and he had occasionally seen a student who was technically well set for a distinction command only a first-class pass because of his inability to express his technical knowledge in clear and concise language. He had also seen a student whose technical knowledge was inferior and who was in danger of failing to make certain of this by setting down his inadequate knowledge in a way which was masterly in its incoherence.

It was unfortunate that a student who had obtained the right answer to a question would never know why he had not received full marks unless someone told him of his lack of style. This disability might then well extend throughout an appreciable portion of his career, unnecessarily limiting his capabilities.

Criticism from Teachers

Teachers already said hard things about the syllabus, particularly when they complained of lack of time to teach adequately all that was expected, but he could not help feeling that half-an-hour spent at the beginning of each syllabus or of each term, coupled with a rigorous standard for style in answering homework questions and in setting out the material on the board in the first place, would go a long way towards converting the large number of second-class passes into first-class passes and, what was ultimately more important, would go a long way towards producing gas engineers who, by learning the art of expressing themselves earlier in life, would contribute rather more quickly to the fund of knowledge which the industry would always need.

Colonel **W. M. Carr,** C.B.E. (Past President), said he felt constrained to take part in the discussion by reason of the remarks made by Mr. Goodrich as a student, which brought to his mind once again the responsibility which they all bore in the education of their staffs. He did not consider that, speaking generally, they had as yet given sufficient consideration to the importance of backing up the student's educational training, what was looked upon as class-room work. He considered that each student in every undertaking should have his course mapped out over a period of years.

Mr. Dyde rightly referred to the importance of the student being called upon to submit reports, but Colonel Carr believed that it was necessary to go very much further than that if they were going to achieve the standard which they desired and must in fact obtain. They must lay down for each student and for each class of students the whole period of training, which should be on the broadest possible basis. The course might well provide for a period of general training in all departments; indeed, that was the practice which, when he was directly responsible for works operation, he initiated himself. The course extended over a period of five years for non-graduate students, while for university graduates it was condensed into three years.

He found that it provided very good results, because text-book learning, though of value, was of very little value if it was not backed by practical application and an appreciation of the situation. Moreover, it must be remembered that what

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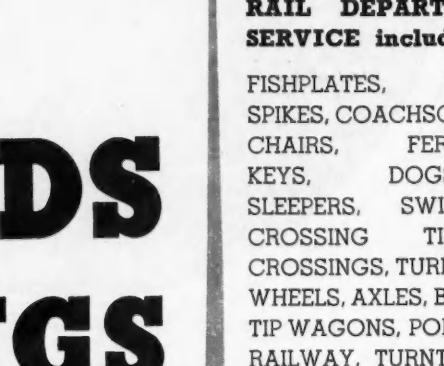

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SC 11

was in the text-book was not always right, and the student wanted to get to the state of mind when he was able to make his own appreciation; when that time had arrived, he was really educated.

Mr. **R. L. Greaves, M.B.E.** (St. Helens), referred to a point which had come to his notice recently, and which he thought might be worth mentioning. In the report a list of approved schools and colleges was given. In his area, one technical college was mentioned as having an Ordinary Manufacture class. It so happened that in 1950 all the students and lecturers were travelling to that approved centre from other towns, and that led him to suggest that arrangements should be made so that an approved centre could 'sub-let' its course, according to circumstances. It might happen that in one year all the students were in a particular town, and so the technical college in that town became approved, and would be likely to regard itself as the approved centre for a wide area.

He was not suggesting that there would be any difficulties in sub-letting, but one could visualise a situation where the technical college would like to remain the one and only centre in the district. Some thought should be given to the matter to see whether anything could be done to increase the number of technical colleges and to arrange that the one which suited the students and lecturers best in any particular year should be approved.

Mr. **F. C. Smith** (Watson House, North Thames Gas Board), speaking as a teacher of some years' standing, remarked that he had a great deal of sympathy with the comments made by Mr. Goodrich, whose remarks about textbooks were very important. He (the speaker) would recommend students who were studying Gas Supply in particular, though he thought it was equally true of Gas Manufacture, wherever possible to get hold of the appropriate B.S.I. specifications. If a student was studying, for example, combustion problems, he could not do better than get hold of B.S.717. In that specification he would find laid out the various methods for determining carbon dioxide and carbon monoxide, and would see clearly those methods which were dependent on oxidation and those which were dependent on reduction and those that depended on physical means. He would also find set out, in a very readable way for a specification, the requirements. For those who wanted to study temperature, which was one of the most difficult subjects to study properly, he would strongly recommend getting hold of the B.S.I. Code on that matter. It was a better presentation of the subject than he himself had ever seen in any text-book. Students might like to know that their teachers could get those specifications for them from the B.S.I. at half price.

Mr. **A. Cole** said he spoke as a young man who had been through the mill as a student and who had also been a teacher, and could therefore see, he hoped, both sides of the case. One point which he wished to make regarding Mr. Goodrich's remarks was that a student did not make his own rules; they were made for him by the education body. He agreed that half an hour did not seem a very long time in which to answer a question in the Ordinary Grade examination, but if a man was, at a later date in his career, to present a matter clearly to a workman, or to make a clear working diagram for a foreman, he must learn to do that in school, and he must learn to transmit his ideas through the medium of paper so that he could answer the examination questions correctly. The examination was only a means to an end, the end being his ability to make himself clear to his colleagues and subordinates at a later date.

There was one further remark which, with some trepidation, he would like to make. He had a chief who was very helpful in his training, but he found that the axiom 'Heaven helps those who help themselves' was very true. During the lunch-hour and at dinner-time the man who went out and got the knowledge for himself from the works was the man who remembered it all his life. Personally, he would be the last to deprecate the schemes which were in being at present for time off with pay, and for students to have every facility offered to them, but he would also ask that serious consideration be given to the need to avoid spoon-feeding the students too much. He felt this very strongly, because the man who found out things for himself never forgot them.

Mr. **F. Nicholls** (Newcastle) expressed great interest in Mr. Goodrich's remarks and said he had heard about this trouble of making sketches for many years from members of his own staff, who complained bitterly of the short time allowed and of the rather wearisome repetition of the complaints about sketches. He had taken several of these questions and taken a drawing of, say, the cross-section of a horizontal retort section and reduced it to the simplest possible form. If, for example, one had a book in front of one containing such a diagram, and copied it, one had to draw so many vertical lines a certain distance apart, one had to arrange for the cross-flues, and so on, and go through the purely mechanical process of dividing up into so many eights of an inch and putting dots in and drawing the lines. They found that, even with a text-book in front of them containing a simplified drawing to copy, timing themselves with a watch they could not do a decent rough sketch in anything like the time given for answering the average question.

He therefore strongly supported Mr. Goodrich's complaint that enough time was not given for the sketches. It might be that the drawing required was one that the man studied 11 months ago, in the early part of the course, and he had to stop and think. It would be interesting if the examiners would try to do some of these sketches and see for themselves how long it took to do the purely mechanical business of drawing the lines. They would then realise that the students needed more time for their sketches.

RECOVERY OF PURE SULPHUR — (Concluded from p. 110)

necessary to have several reactors, which, of course, put up the capital cost. He had quoted figures for particle sizes. He had not worked with this size range, and his work had been with closely-sized material. What he had done when he had got this size was to work through the available material, find out the largest sized particle that had been fluidised and the smallest sized particle that had been fluidised—and he did not say that they had both been fluidised in the same unit.

He agreed with Dr. King that hot air and xylene would not be a very nice mixture, but in presenting the report he had referred to 'hot gas' which, of course, put a different bearing on the matter.

The wide divergence of size of the oxide was a snag. One was limited to a certain particle size range; outside that range one could not fluidise and, as with all things, one could not have 100% good. There were certain advantages and certain disadvantages. That had to be borne in mind in all processes.

He would certainly like to look at the publication from the Carnegie Research Institute. He agreed that the thermal efficiency of the system might not be too good. Possibly by the use of heat exchange it would be possible to cut down the heat load; but he wanted it to be borne in mind that this was a purely tentative suggestion. He did not claim to be a design engineer. This was what he had in mind, and he was looking for someone to hack it about and possibly put it into shape.

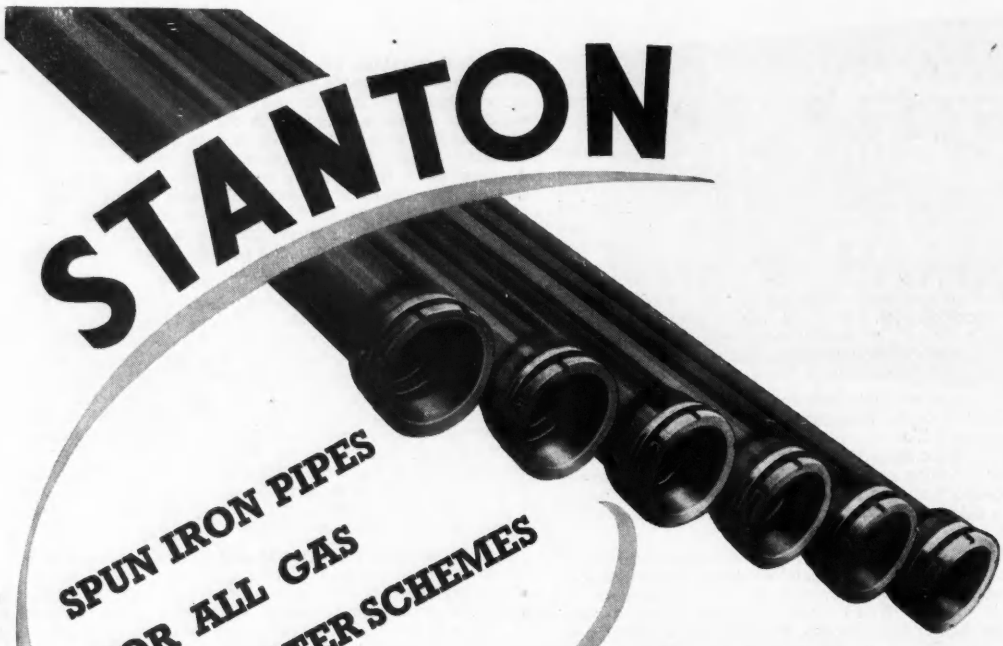
AREA BOUNDARIES

The Minister of Fuel and Power has made an Order transferring that part of the housing estate at Sheerwater, Surrey, which lies to the south of the Basingstoke Canal, and an additional strip of land adjoining it on the same side of the canal, from the area of the North Thames Gas Board to the area of the South Eastern Gas Board. The Order—the Gas (Area) (Sheerwater, Surrey) Order, 1950 (Statutory Instrument No. 2010)—was laid before Parliament on December 14 and came into operation on January 1.

The old boundary crossed the site of a new L.C.C. housing estate of about 1,300 dwellings. Gas could be supplied to the whole estate from existing mains of the South Eastern Gas Board, whereas a new main costing about £14,000 would have been necessary if the North Thames Gas Board had had to supply gas to that part of the estate that was formerly within its area. When the proposed transfer came before the North Thames Gas Consultative Council in July it agreed to raise no objection to the Order.

A Meeting of the Institute of Fuel will be held on January 16, at 5.30 p.m., at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, when a paper on 'Transport and Storage of Coal' will be presented by Mr. Lionel Locket.

STANTON



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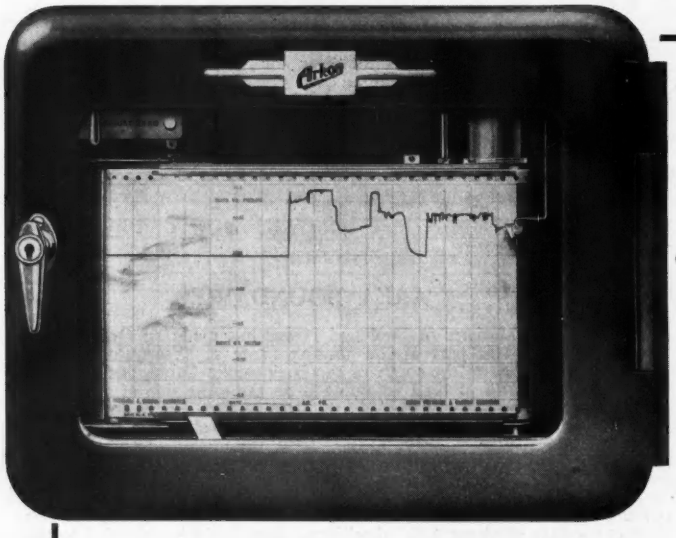

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The ARKON Model 1600 is a new instrument for the measurement and recording of pressure or draught, or a combination of both. It provides a high degree of accuracy, sensitivity and a high magnification of very low readings. A simple design combined with a robust construction makes the ARKON Model 1600 particularly suitable for work in difficult conditions, as in gas works, coke oven plants, steel works, foundries, etc.

The wide rectangular chart is easily read by unskilled operators. The chart mechanism has many new features so that it requires less attention to maintain a close and continuous record.

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Stocked by your local merchant

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ARE THE MAKERS
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MALLEABLE IRON
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OVER FIFTY YEARS
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AIR TEST AND TAPER THREADS GUARANTEE THEIR UNFAILING SERVICE

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Send to us the details of your plant, stating Tube sizes and lengths, head (or side) clearance, and we will quote you for a complete installation of our Flow-breaker system.
Easily the most inexpensive, yet efficient system ever offered! On one extended test the co-efficient of Heat Transfer rose from 80 to 140 at 0.6 feet vertical upward cooling.
Cost of permanent installation no more than actual normal cost of general overhaul and cleaning.
No sludge. No replacements

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GAS PLANT, GASHOLDERS, PURIFIERS,
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W.D. (SHEETERS) LTD.
BARCLAYS BANK CHAMBERS, OWEN STREET, TIPTON,
Telephone: TIPTON 1958. STAFFS.

COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.
See our Advertisement Next Week.
REAVELL & CO. LTD. IPSWICH.

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Quarterly Volumes of the "Gas Journal."
5/- each, post free
Walter King, Ltd., 11, Bolt Court, Fleet Street, London, E.C.4.

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GAS RETORTS
Write for particulars of how E.B. experience can help in reducing maintenance costs in refractory constructions.
Manufacturers of all types of Cements.
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RETORTS MADE GAS TIGHT
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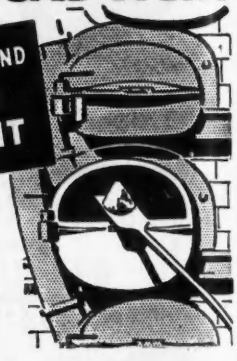
ONX SUPER 83 BRAND FIRE CEMENT

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"We are pleased with results obtained after using ONX Super '83' Brand.
"Our settings were very bad, with large cracks in retorts, and portions of wall actually collapsed.
"Now, six months after repairing 28 retorts they appear as sound as ever; we anticipate the life of the settings will be prolonged."
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Oxide supplied on loan or sale outright.
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THE COOKER CLEANER
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BRIGHT, SON & CO.
(CLERKENWELL) LTD.
FOR PUBLIC LIGHTING.
CLOCK CONTROLLER REPAIRS.
20 Northburgh St. Clerkenwell, E.C.1. Clerkenwell 7171.
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PLANT FOR SALE & WANTED

WALES GAS BOARD
WANTED. SECOND-HAND GAS FIRED STEAM BOILERS complete with Automatic Control. Full particulars of evaporation capacity, equipment, maker's name, number and price to be sent to, THE MECHANICAL ENGINEER, Wales Gas Board, Grangetown Gas Works, Cardiff.

PHONE 98 STAINES.
FOR SALE. ELECTRICAL CENTRIFUGAL PUMP, 400/3/50, 7½ h.p., 164 g.p.m., 65 ft. head. 26 k.w. DIESEL GENERATING SET, 220 v.D/C., "Weir" and "Serck" CONDENSERS from 4 ft. × 6 in. up to 7 ft. × 1 ft. 6 in. (some unused).
Two R.S. EGG ENDED TAR STORAGE TANKS 34 ft. × 5 ft. 6 in. diameter.
Two W.S. CYL. TANKS, 10 ft. × 6 ft. 8 in. diam.
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COOKERS FOR SALE.
200 (Approx.) RADIATION NEW WORLD COOKERS, sizes 1, 2 and 3. Vitreous Enamelled throughout. Taps and thermostats chrome plated, and tested. Suitable for hire or sale as renovated cookers.
W. H. COOPER & Co. (WEST END), LTD., 21, Napier Road, Bromley, Kent.

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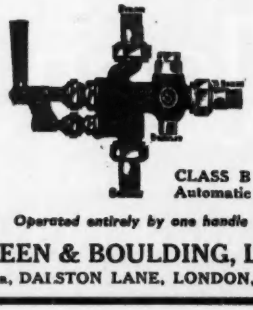
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Automatic
Operated entirely by one handle
GREEN & BOULDING, LTD.
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EDUCATIONAL

THE UNIVERSITY OF LEEDS
DEPARTMENT OF COAL GAS AND FUEL INDUSTRIES (WITH METALLURGY)
SPECIAL Courses of afternoon Lectures will be given during 1951 as follows:
BY-PRODUCT COKING PROCESSES. F. H. Metcalf, B.SC., A.M.INST.F.
THE UTILISATION OF FUELS—SOLID AND GASEOUS.
THE DISTRIBUTION OF GAS. F. L. Atkin, M.I.MECH.E., M.INST.GAS E.
INDUSTRIAL GAS PRACTICE. J. F. Waight, B.SC.(ENG.), A.M.INST.GAS E.
DOMESTIC GAS APPLIANCES. F. Brinsley, M.SC.(TECH.), M.INST.GAS E.
DOMESTIC SOLID FUEL. J. S. Hales.
DISPOSAL OF WASTE LIQUORS PRODUCED IN GASWORKS AND COKE OVENS. W. H. Blackburn, M.SC., PH.D.
REFRACTORY MATERIALS. T. R. Lynman, F.R.I.C.
The first series of six lectures will commence on Monday, January 22, 1951.
Further particulars of all Courses may be obtained from the Assistant to the Director of Extra-Mural Studies, Extension Lectures, The University, Leeds, 2. 6666

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PUBLISHERS' NOTICE

The "Gas Journal" is published every Wednesday, price 1/-; by post 1/2d.

NEW SUBSCRIPTION and CLASSIFIED ADVERTISEMENT RATES OPERATING FROM JAN. 1, 1951.

Subscription Rates: Home and Empire :- 52/- per annum; Foreign :- 60/- per annum. (Both payable in advance.) A copy of the "Gas Journal" Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words) - minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area of inside pages 10" deep x 7" wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

MIDLANDS OFFICE: 10, Union Street, Birmingham.

NORTHERN MANAGER: W. Q. Foster, 33, St. Helens Road, Harrogate. 'Phone: Harrogate 84291.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: CENtral 2236-7. Telegrams: Gasking, Fleet, London.

APPOINTMENTS VACANT

SALES MANAGER / REPRESENTATIVE required by large manufacturers of Gas Meters, etc., in the North-West, with well-established connection in the North of England. Experience in the Gas Industry essential, and applicants are asked to give fullest particulars which will be treated in the strictest confidence. Remuneration commensurate with the importance of the position, and Pension and Life Assurance scheme in operation. Apply No. 9944, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

DRAUGHTSMEN

GAS PLANT.

IMPORTANT Midland Company require a number of first class DESIGN and/or DETAILING DRAUGHTSMEN for all classes of Gas Holders and Gas Plant, etc., positions offer exceptional experience.

Canteen and excellent working conditions available.

Particulars and salary required to Personnel Manager, Horseley Bridge and Thomas Piggott, Ltd., Tipton, Staffs.

EASTERN GAS BOARD

IPSWICH DIVISION.

COLCHESTER UNDERTAKING.

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at Colchester Gas Works.

Applicants should hold the Institution s Higher Grade Certificate in Gas Engineering (Manufacture) and have experience as well as the practical knowledge of general works operation, control of Continuous Vertical Retorts and drawing office and laboratory practice. Constructional experience will be an advantage.

The salary will be in accordance with Grade VI, £415 to £495 per annum.

Applications, stating training, experience, qualifications and age, should be addressed to the undersigned to be received within 14 days of the date of this advertisement. The application should give the names of two referees.

F. ALLEN,
Group Manager.

Eastern Gas Board,
Gas Works,
Colchester.

EASTERN GAS BOARD

SUDBURY DISTRICT.

DISTRICT SUPERINTENDENT.

APPLICATIONS are invited for the position of DISTRICT SUPERINTENDENT to the above District.

The Sale of gas in this district is approximately ninety-eight million cubic feet per annum.

Applicants should have received a sound practical training and should have experience in modern distribution methods. The duties of the successful candidate will include advising consumers and preparing estimates for the installation of all types of gas apparatus.

A five-room flat over the Board's showroom is available at a reasonable rent.

The salary will be in accordance with the A.P.T. Grade IV (Provincial B—£235-£405), the initial salary being determined by the qualifications and experience.

The successful candidate may be required to pass a medical examination and will be subjected to such Superannuation Regulations as the Board may, in due course, adopt.

Applications, stating age, and giving full particulars of education, training and experience, should be forwarded to the Group Manager, Bury St. Edmunds Group, Gasworks, Bury St. Edmunds, to reach him not later than fourteen days after the appearance of this advertisement.

INITIATIVE and enthusiasm, together with experience in general and, preferably, heating engineering, required for position with old-established medium-sized Birmingham food machinery manufacturers. Position involves design and drawing work, and this should contribute to a further widening of the firm's activities. Applications will be considered also from younger men with adequate knowledge.

Give full details—which will be treated in strict confidence—of experience, age, salary required, to COX OVENBUILDERS, LTD., King's Road, Birmingham, 11.

SCOTTISH GAS BOARD

EDINBURGH GROUP.

CHIEF CONSTRUCTIONAL ASSISTANT.

APPLICATIONS are invited for the position of CHIEF CONSTRUCTIONAL ASSISTANT in the drawing office at the Granton Works of the Edinburgh Undertaking.

The successful candidate will be responsible for major construction and renewal of plant including substantial works extensions from planning stage to completion, and must be capable of preparing specifications and drawings for, and of directing construction and erection of all kinds of gasworks plant.

Candidates are required to possess the Higher Grade Certificate in Gas Engineering (Manufacture) or an equivalent qualification of the Institution of Mechanical, Civil or Structural Engineers.

The salary scale will be A.P.T. XII, £645 to £770 per annum, and placing on the scale will be in accordance with experience and qualifications.

The successful candidate will be required to pass a medical examination and will be subject to the provisions of any superannuation scheme which the Board may introduce.

Applications, stating age, training, qualifications, and experience, accompanied by *copies* of not more than three Testimonials, should be made to the undersigned not later than the first post on Monday January 15, 1951.

DAVID BEAVIS,
Group Manager.

15, Calton Hill,
Edinburgh, 1.

NORTH WESTERN GAS BOARD

FURNESS GROUP.

BARROW-IN-FURNESS DISTRICT.

INSTALLATIONS OFFICER.

APPLICATIONS are invited for the above appointment. Candidates should hold the Higher Grade Certificate in Gas Engineering (Supply) and the 1st Class Final City and Guilds Certificates in Gas Fitting or Plumbing.

The successful applicant will be responsible under the Sales and Service Officer for the installation and maintenance of meters and gas appliances and the control of fittings and maintenance staff and workshop personnel engaged upon such installation and maintenance work.

The salary will be within the range of Grade A.P.T. VIII (£490-£570) of the National Salary Scales; the commencing salary being fixed according to experience.

The successful applicant may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applications stating age, training and present position, qualifications and experience, together with the names of two referees, should be forwarded to the undersigned to arrive not later than fourteen days following the date of publication of this advertisement.

W. OLDHAM,
General Manager.

19, Abbey Road,
Barrow-in-Furness.

NORTH WESTERN GAS BOARD

LIVERPOOL GROUP.

APPOINTMENT OF INDUSTRIAL SALES ENGINEERS.

APPLICATIONS are invited for the above appointments within the salary range Provincial "A," A.P.T. VII, £450-£530 per annum. The successful applicants may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applicants should preferably have had experience in the operation of Industrial Gas Appliances or heat process work and should possess the Higher Grade Certificate of the Institution of Gas Engineers (Supply) or Higher National Certificate in Mechanical Engineering or equivalent qualification.

Letters of application, giving details of experience and stating age and qualifications, should be addressed to the Chief Personnel Officer to be received not later than Monday, January 22, 1951.

C. H. LEACH,
General Manager.

Radiant House,
Bold Street,
Liverpool, 1.

NORTH WESTERN GAS BOARD

SOUTH LANCASHIRE GROUP.

ST. HELENS WORKS.

CHIEF CHEMIST.

APPLICATIONS are invited for the position of CHIEF CHEMIST at the St. Helens Works.

Applicants should preferably be Gasworks trained and be fully conversant with the Chemical Control of all Gasworks Plant and Ancillaries of all descriptions appertaining to such Plant.

As a minimum qualification, the Applicant should possess the Higher Grade Certificate (Manufacture) of the Institution of Gas Engineers.

The salary will be in accordance with qualifications and ability and within the range £570-£670 per annum.

The successful candidate may be required to pass a medical examination and subscribe to such scheme of Superannuation as the Board may adopt.

Applications, stating age, qualifications and experience, together with the names and addresses of two referees, should be forwarded to the undersigned not later than 14 days after the publication of this advertisement.

R. L. GREAVES,
General Manager.

Radiant House,
St. Helens.

NORTH WESTERN GAS BOARD

MANCHESTER GROUP.

SENIOR ADMINISTRATIVE ASSISTANT.

APPLICATIONS are invited from suitably qualified persons for the above appointment on Group Headquarters' Staff.

The salary will be £900 per annum.

The successful candidate will be required to assist the Group Administrative Officer generally in the co-ordination of the commercial and administrative activities of the Group. Applicants should have had a good commercial training and organising experience.

The appointment is subject to such conditions of service as may be laid down by the Board and the successful applicant may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applications furnishing details of age, qualifications and experience, together with the names and addresses of two persons to whom reference may be made should be forwarded to the General Manager, North Western Gas Board, Manchester Group, Town Hall, Manchester, 2, within 14 days of the issue of this advertisement.

Envelopes should be marked "SENIOR ADMINISTRATIVE ASSISTANT."

J. WILSON,
General Manager.

Town Hall,
Manchester, 2.

(Classified advertisements continued on Supplement 4)

APPOINTMENTS VACANT (ctd.)

DRAUGHTSMEN required for Chemical Works in North Lincolnshire, age 20-25, must have had good general training with some workshop experience and with technical qualifications up to H.N.C. The positions offered are permanent with good prospects. Write, stating age, experience, qualifications and salary required, to : No. 9946, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

LOCAL APPOINTMENTS COMMISSION, DUBLIN.

ASSISTANT GAS ENGINEER, CORPORATION OF LIMERICK.

APPLICATION forms and particulars from the Secretary, 45, Upper O'Connell Street, Dublin. Salary : £550-£20-£750, plus temporary bonus of 7½ per cent. with entry above the minimum in certain cases. Car allowance paid. Essential qualifications, (*a*) supervisory experience in Gas Manufacture, (*b*) knowledge of (i) modern methods of carbonisation, (ii) application of gas to domestic and industrial purposes, and (iii) disposal of residual products.

Latest time for receiving completed application forms : 5.0 p.m. on January 19th, 1951.

NORTHERN GAS BOARD

SUNDERLAND DIVISION.
CHEMIST.

APPLICATIONS are invited from suitably qualified persons for the above position, to take over the supervision of chemical testing throughout the Division. Practical experience of modern gasworks plant operation and routine testing is essential.

Salary Grade A.P.T. VIII Scale £490-£570, and commencing at a figure commensurate with qualifications and experience.

The successful candidate will be required to pass a medical examination and the appointment will be subject to the provisions of such superannuation scheme as may be adopted by the Board.

Applications, stating age, experience and qualifications, giving names of two referees, should be addressed to the undersigned within 14 days of the issue of this advertisement.

W. O. KIRKWOOD,
Fawcett Street, Divisional General Manager.
Sunderland.
December 21, 1950.

NORTHERN GAS BOARD

DARLINGTON DIVISION.
DARLINGTON UNIT.
ASSISTANT DISTRIBUTION ENGINEER.

APPLICATIONS are invited from suitably qualified persons holding Higher Grade Certificate in Gas Engineering (Supply) for the appointment of ASSISTANT DISTRIBUTION ENGINEER to the Darlington Unit.

The salary offered for the post is in accordance with A.P.T. Grade VII of the National Scales for Salaries, *viz.*, £450-£530 per annum.

Candidates must have a thorough knowledge of modern methods of gas distribution, including high and low pressure systems.

The successful candidate will be required to pass a medical examination and to subscribe to such superannuation scheme as may be adopted by the Board.

Applications, stating age, qualifications and experience, together with the names of two referees, should be addressed to Charles Hindle, Esq., Engineer and Manager, Darlington Unit, Northern Gas Board, John Street, Darlington, not later than January 20, 1951.

F. WILSON,
Divisional General Manager.
December 20, 1950.

NORTHERN GAS BOARD

SUNDERLAND DIVISION.
CONSETT UNIT.
DISTRIBUTION SUPERINTENDENT.

APPLICATIONS are invited from suitably qualified persons for the appointment of DISTRIBUTION SUPERINTENDENT at the above Unit.

Applicants must be experienced in all branches of gas utilisation and distribution and have a sound knowledge of high and low pressure gas transmission, service work, and the fitting and maintenance of appliances.

Applicants must have definite distribution experience and possess recognised technical qualifications. Preference will be given to applicants holding the Institution of Gas Engineers Higher Grade Certificate (Gas Supply) or equivalent technical qualification.

Salary Grade A.P.T. VII, Provincial B, Scale £435-£515, and commencing at a figure commensurate with qualifications and experience.

The successful candidate will be required to pass a medical examination and the appointment will be subject to the provisions of such superannuation scheme as may be adopted by the Board.

Applications, stating age, experience and qualifications, giving names of two referees, should be addressed to Mr. J. R. Matthew, Unit Manager, Consett Unit, Thomas Street, Consett, Co. Durham, within 14 days of the issue of this advertisement.

W. O. KIRKWOOD,
Fawcett Street, Divisional General Manager.
Sunderland.
December 21, 1950.

PIPE JOINTERS AND PIPELAYERS required, used to live gas and willing to travel. Apply, giving full particulars of experience, etc., to No. 9945, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

SOUTH EASTERN GAS BOARD

EAST SURREY DIVISION.
CLERICAL OFFICER—SALES AND SERVICE DEPARTMENT.

APPLICATIONS are invited for the position of DIVISIONAL CLERICAL OFFICER for the Sales and Service Department of the East Surrey Division.

The duties will cover the co-ordination of sales and service clerical methods and work throughout the Division.

Wide clerical experience is necessary and an accounting or secretarial qualification would be an advantage.

The successful applicant will be directly responsible to the Divisional Sales and Service Manager.

The salary on appointment will be not less than £750 per annum.

Applications in writing (quoting reference V10/119), giving age, present occupation, experience and qualifications, etc., should reach the undersigned not later than fourteen (14) days after publication of this notice.

R. J. MCCRAE,
Katharine Street, Personnel Manager.
Croydon.

SOUTH EASTERN GAS BOARD

METROPOLITAN DIVISION.
ASSISTANT WORKS CHEMIST—ROTHERHITHE WORKS.

APPLICATIONS are invited for the above- mentioned position.

The responsibilities of this post include the technical supervision of all Gasworks processes with particular reference to carbonisation and general control of horizontal retort settings. Candidates should be gasworks trained and must be fully qualified by education and experience. They should be capable of supervising staff under their control and of deputising for the Works Chemist whenever necessary.

The salary will be within Grade IX of the Salary Scales of the National Joint Council for Gas Staffs (Metropolitan Area) in respect of Male Administrative, Professional and Technical Staffs (£550 to £650 per annum).

Applications in writing (quoting reference V10/125), giving age, present occupation, experience and qualifications, etc., should reach the undersigned not later than fourteen (14) days after publication of this notice.

R. J. MCCRAE,
Katharine Street, Personnel Manager.
Croydon.

SOUTH WESTERN GAS BOARD

APPOINTMENT OF SUB-DIVISIONAL ACCOUNTANT.

APPLICATIONS are invited for the post of SUB-DIVISIONAL ACCOUNTANT for the Swindon Sub-Division at a salary within the range £775 to £850 per annum.

Applicants must hold a recognised Accountancy qualification and have had experience in financial administration and control of staffs, preferably in a Public Utility Undertaking.

The successful applicant may be required to pass a medical examination and to subscribe to such scheme of Superannuation as the Board may adopt.

Applications, stating age, qualifications and experience, together with details of present and previous appointments and the names and addresses of two persons to whom reference can be made, should be received by the undersigned not later than Tuesday, January 16th, 1951.

W. N. CURTIS,
9a, Quiet Street, Secretary and Solicitor.
Bath.
January 2, 1951.

EAST MIDLANDS GAS BOARD

LEICESTER AND NORTHANTS DIVISION.
ASSISTANT WORKS ENGINEER.

APPLICATIONS are invited for the position of ASSISTANT WORKS ENGINEER at the Aylestone Road Works of the Leicester Undertaking.

Applicants should have a sound practical knowledge of Gas Works practice, carbonisation in continuous vertical retorts, fully automatic Water Gas Plants, and supervision of labour.

The successful applicant will be responsible for Gas production at the Aylestone Road Works.

Commencing salary will be not less than £750 per annum.

The successful candidate may be required to pass a medical examination, and the appointment will be subject to such superannuation scheme as may be adopted by the Board.

Applications, stating age, and giving full details of qualifications and experience, together with the names of two referees, should be received by the undersigned not later than February 3, 1951.

C. C. WOOD,
Gas Offices, Divisional General Manager.
Millstone Lane,
Leicester.

EAST MIDLANDS GAS BOARD

LEICESTER AND NORTHANTS DIVISION
LOUGHBOROUGH UNDERTAKING.

THE Loughborough Gas Undertaking has vacancies for (*a*) GAS FITTERS, 1st or 2nd Class, preferably holding City and Guilds Certificate, with experience in modern domestic or industrial installations ; and (*b*) experienced MAINS AND SERVICE LAYERS.

Appropriate J.I.C. rates for Provincial 'A' Undertaking.

Application should be made in writing without delay to the Manager, Gasworks, The Rushes, Loughborough.

EAST MIDLANDS GAS BOARD

APPOINTMENT OF EDITOR OF THE BOARD'S HOUSE JOURNAL.

APPLICATIONS are invited from technical journalists to edit the monthly house journal of the East Midlands Gas Board.

Experience in feature writing, sub-editing, layout and typography is essential and applicants must be able to assume complete responsibility for the production, distribution and sales of the magazine. The post will entail responsibility for press relations under the direction of the Secretary of the Board. A knowledge of the Gas Industry, although not essential, is desirable.

The salary for the appointment will be not less than £700 per annum.

The successful candidate will be required to pass a medical examination and to subscribe to such Superannuation Scheme as the Board may adopt in the future.

Applications, stating age, education, qualifications and experience, and giving the names of two referees, should be addressed to the undersigned to arrive not later than January 22, 1951.

A. GWYNNE DAVIES,
Beverley House, Secretary.
University Road,
Leicester.

EAST MIDLANDS GAS BOARD

ENGINEERING ASSISTANT—HEADQUARTERS.

APPLICATIONS are invited for the appoint- ment of ENGINEERING ASSISTANT at the Headquarters of the East Midlands Gas Board. The commencing salary will be not less than £800 per annum.

This is the only engineering appointment at the Board's Headquarters. The work will consist mainly of the preliminary examination of applications from Divisions for authorisation of capital expenditure on engineering projects, but it will also involve a certain amount of co-ordinating and secretarial work, more particularly in connection with the functions of the Board's Engineering Committee.

Associate Membership of the Institution of Gas Engineers will be a minimum qualification, and membership of other kindred Institutions or the possession of an appropriate degree will be taken into account in assessing the suitability of candidates.

The successful candidate may be required to pass a medical examination, and the appointment will be subject to such Superannuation Scheme as may be adopted by the Board.

Applications stating age, education, qualifications and experience, together with the names of two referees, should be addressed to the undersigned to reach him not later than January 25, 1951.

A. GWYNNE DAVIES,
Beverley House, Secretary.
University Road,
Leicester.

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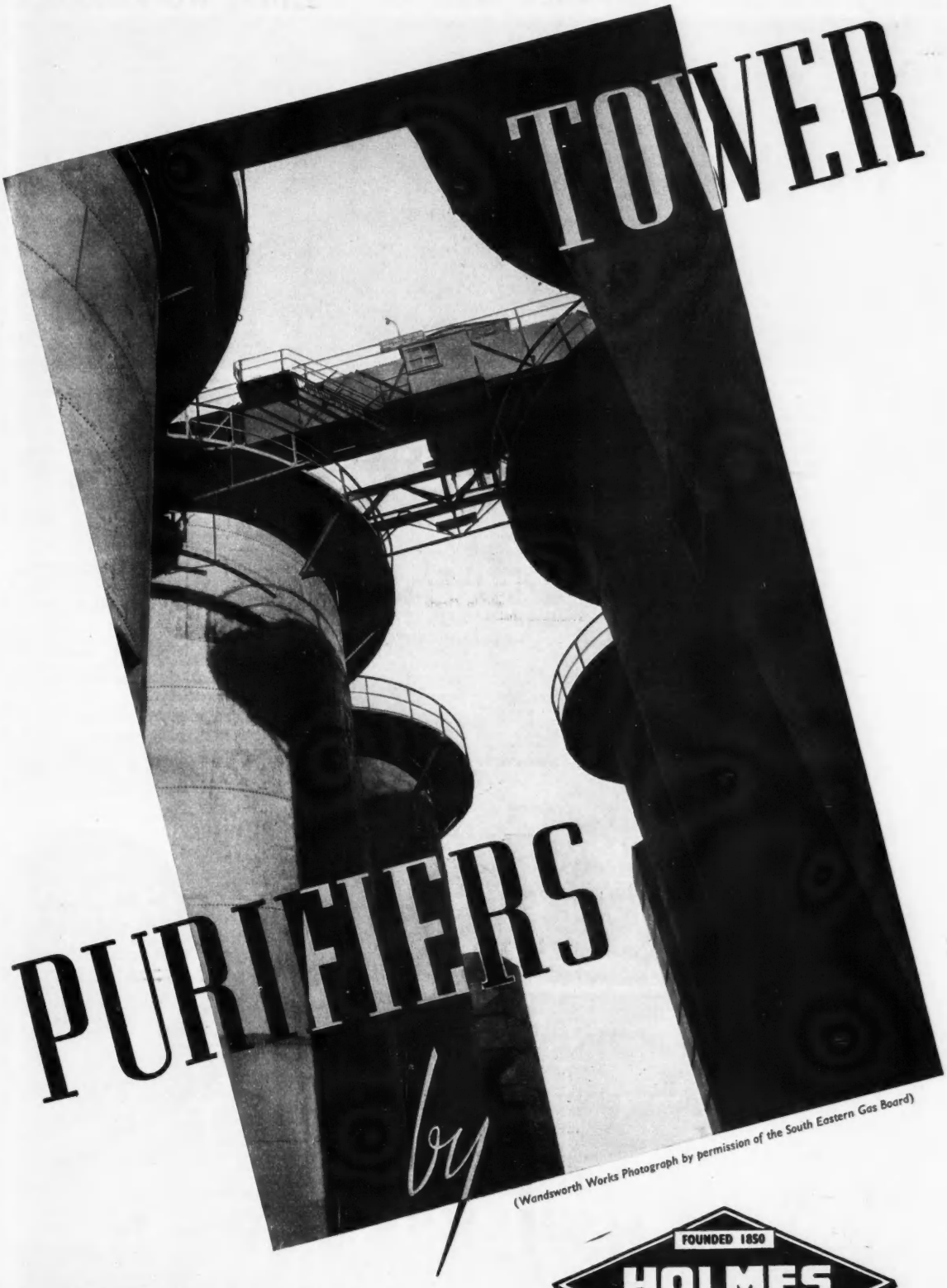

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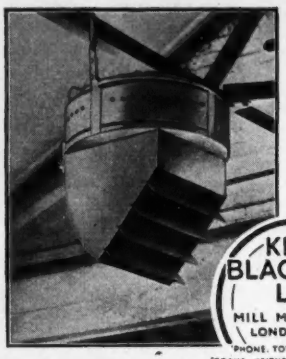

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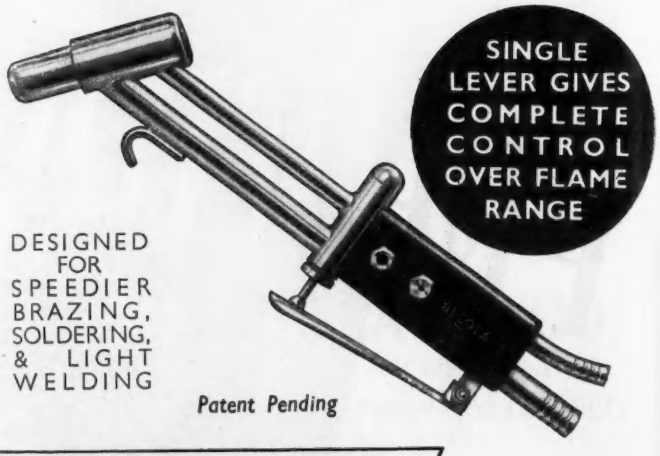

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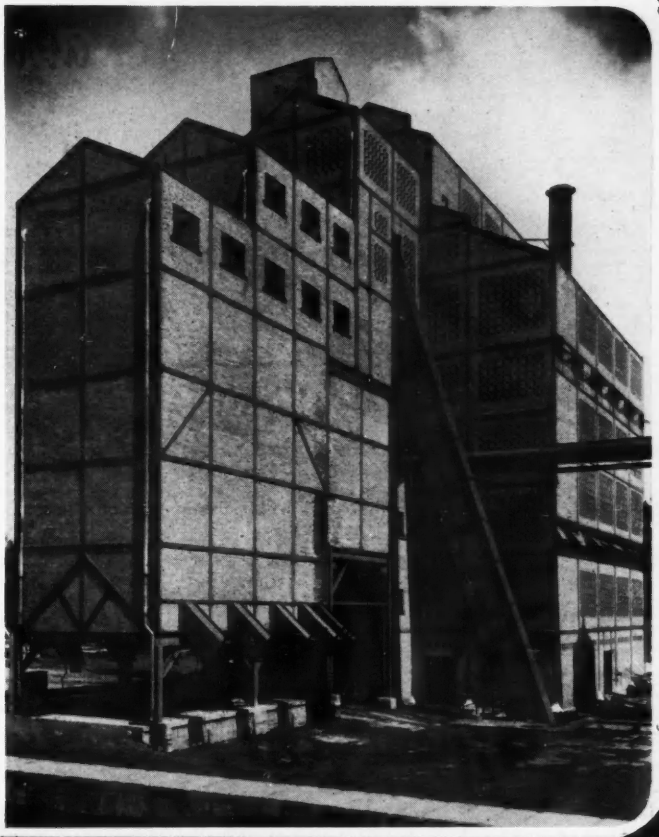
Printed by Straker Brothers Ltd., E.C.2, for Walter King, Limited, 11, Bolt Court, Fleet Street, London, E.C.4. Wednesday, January 10, 1951.

Work in progress



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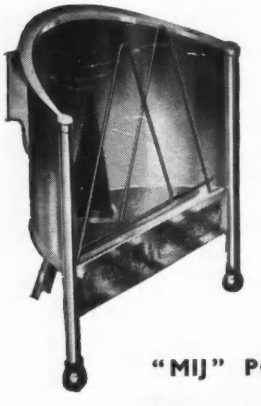
CONVECTOR GAS FIRE, FA/7
This attractive background heater (above) radiates some of its heat and distributes the remainder by convection. It is fitted with four Neat burners which heat a pair of fireclay radiants. Ideal for halls or landings. Finished in cream heat resisting enamel with chromium plated top.

FA-NEAT GAS SPACE HEATERS

Neat gas burners — mix gas and air at the point of combustion. They cannot therefore light back yet give perfect combustion. They are silent and have single point adjustment.

Low gas consumption — The Neat burner principle, in conjunction with special radiants of appropriate design, gives exceptional heat output for the gas consumed.

Sturdy construction — made of heavy fine quality materials by the makers of the famous Ascot Gas Water Heaters, and to the same high standards.



Featuring an unbreakable chrome steel radiant, this heater provides a remarkably high degree of heat radiation for a gas consumption as low as 6½ — 7 cu. ft. per hour through three Neat burners. It is finished in heavy chromium plate and processed aluminium. The most suitable fire for small rooms or localised heating.

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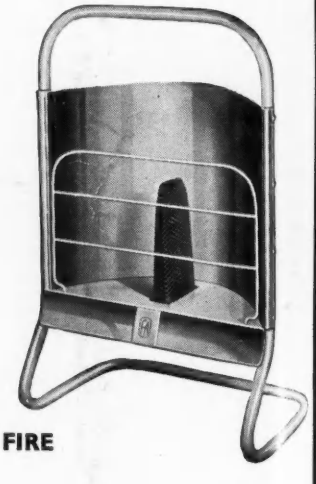
This strong, handsome heater is suitable for the medium sized room. Its radiant, made of chrome steel, is unbreakable and is scientifically designed to give high radiant efficiency. The reflector is chromium plated on heavy brass and the remainder of the heater is attractively finished in cream enamel.



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